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AN HISTORICAL BOARD OF ALDERMEN.

Knowing full well that time and time over abundant and substantial proof has been afforded of the absolute truth and veracity of the antiquated and venerable assertion regarding the fact that "history repeats itself," we still must confess to having received with surprise a message from Boston (Mass.) conveying the information that the Boston Board of Aldermen have seen fit to furnish a striking and complete exemplification of how history can be relied upon at all times to double itself up. Indeed, no other class of business man operating within the confines of the United States is more apt to acknowledge the truth of the time-honored saying than is the gas maker; for he has a bewildering choice of examples at his command wherewith to pick from whenever, or from whatever cause, he finds his belief in the truth of the old adage becoming somewhat impaired. The fraternity of the country, when the action of the Boston Board of Aldermen, at its session of date of 29th of last September, when it refused permission to the Consumers Gas Light Company to operate an opposition plant within the borders of the "Hub," was placed before them in the columns of the JOURNAL, were at first disposed to think that a new era was to be inaugurated; and that possibly there was some sort of reason for supposing other civic bodies throughout the States might in due time consider it as a part of their duty to give protection to honestly invested money from the attacks of plunderers whose shrewd scheme is to gull the public eye and charm the public ear by flaunting banners inscribed with proclamations promising relief, and chanting songs set to the thinly-worn tune of opposition to monopoly. Then in some minds this idea became all the more firmly fixed from the fact that the first manifestation of Aldermanic progress proceeded from the municipal body appointed to watch over and guard the internal civic welfare of America's most highly regarded moral and mental center. But, on the other hand, there existed another set of bold unbelievers, who most tenaciously advanced the opinion that the end of the Boston case was not yet reached and still audaciously predicted in effect that the members of Boston's "model body" would sooner or later have such a strong application of "persuasive reasons" presented to their intensely moral minds as to make them see the "foolishness," if not the error, of their erstwhile conservative procedure. Well, the unbelievers, at the present time of writing, have much the best of the argument; for, to put it concisely, a majority of the Council, on date of Tuesday, November 18th, turned as neat a case of municipal double-back-action somersault as has ever been put upon record—the acrobatic feat consisting in passing an ordinance granting the Consumers Gas Company the right to go ahead and lay its mains.

Now, far be it from our purpose to assert that corrupt motives—in plain English, that money was paid to effect the desired object—influenced the wonderful change of feeling experienced by Aldermen Hall and Slade; but it certainly appears to be within our legitimate province, as journalists, to show the utterly irreconcilable position taken by these gentlemen now, when contrasted with their written statements embraced in the report handed in to the Council by the Committee on Paving at the Board's session on the first day of last September—the members of that committee consisting of Messrs. Slade, Hall, and Fernald.

The majority report, signed by the two first named, conveyed the intimation that the Committee had given a long and patient hearing to those interested in the subject, and failed to discover that the consumers of the city had any cause for complaint against the corporations supplying the city with

gas. They found that a consideration of the advantages which petitioners offered to the city and citizens of Boston utterly failed to show any existing necessity for the privileges sought after; that the Board of Aldermen had no right to grant permission to a company to do business under a process which had never passed beyond the stage of experiment; and closed their list of objections with the remark that it was inexpedient to allow so great a privilege as is requested to be controlled by persons who have not the interest of citizenship in the city of Boston, and are simply engaged in the business enterprise as a financial investment.

The foregoing is supposed to have been an exact typification of the way in which Messrs. Slade and Hall regarded the Consumers' position on date of September 1st; but how great is the change between the Slade and Hall of early September, when compared with the Slade and Hall of late November! Alderman Fernald, who introduced the latest ordinance to the Board, has at least been guided by a uniformity of thought and action; and, while we can not commend the course which he has chosen to pursue in regard to the establishment of a competing company, we accord to him evident and unmistakable possession and ownership of a mind of his own, in which important particular he rather radically differs from his erratic and acrobatic associate committeemen. Great being the force of habit, perhaps the flighty pair were unable to overcome their irresistible inclination to make all their official acts harmonize—for whoever heard of a case (prior to the action taken by the Boston Board in September) where the aldermanic body in any one of our large cities sought to protect the vested interest of the gas maker?

The London *Journal of Gas Lighting*, in making recent editorial comment upon the subject of gas competition in the United States, says: "We hope our American cousins will not take offence at our saying these passages" (referring to the Atlanta, Ga., exposure made in our columns) "also serve to recall to the minds of English gas engineers the dark ages of gas supply in this country." Our contemporary need not in any sense have made excuse for what it said; the American gas investor must hang his head in shame and simply acknowledge that no stricture, however severe, would be out of place in properly characterizing the outrageous action of our local legislators. Dark ages, indeed! what plainer evidence is needed that we are dwellers in the blackest night-time of municipal imbecility and inanity than that afforded by the course of the Boston Board of Aldermen.

When the Consumers Company's petition was presented during the past summer it took about two months' time before the measure was, or thought to be, finally disposed of; yet when the second petition is brought to the notice of the august body, and despite all the evidence so laboriously gathered together at the former period, and all that evidence was adverse to consent, the scheme is now rushed through in considerably less time than two hours.

It, of course, is almost useless to point to New York city, as the "arguments" evidently employed by the financial agents of the Consumers concern in so radically and effectively changing the result obtained in Boston in September, no matter what nature those "arguments" may have partaken of, appear to have been thoroughly potent. But still, suppose it to have been possible that New York city (with its population and wealth), through the wisdom of its legislators, had been allowed to have, say, at most, two companies at any one time operating within its limits, ordinary consumers would not now be under the necessity of paying $1.75 per thousand for gas. Most gladly and willingly would the present Consolidated Company supply its product at lower figures, but is debarred from such a course solely and simply on account of the defective legislation of former years, which admitted competitor after competitor in thoroughly reckless fashion. Should the action of Boston's Board of Aldermen be sustained by the mayor, and upheld by the courts, why, the era there of cheaper gas will be made all the more remote; for it was hoped and expected that the Boston Gas Light Company, at no distant time, would have seen its way clear to a pursuance of its hitherto liberal policy in the matter of reducing selling rates.

[Since the above was written news has been received to the effect that the ordinance passed by Board of Aldermen was vetoed by the mayor. We shall refer to this subject again.]

THE GUILD OF GAS MANAGERS DOING HONOR TO MR. CABOT.

Now that it is generally known to the fraternity that Mr. Geo. D. Cabot is about to retire from the active management of the Lawrence, Mass., Gas Light Company, and that his successor has been chosen, as announced in the last issue of the JOURNAL, this appears to be a thoroughly appropriate time to make note of the action taken some while ago by the Guild of Gas Managers, the members whereof, when convinced that Mr. Cabot would not recede from his determination to seek relief from business cares, decided to show in marked and appropriate manner the estimate they had placed upon his sterling worth as an associate and co-worker.

It was not to be supposed that the Guild of Gas Managers would let such an event as the retirement of one of New England's oldest, most widely known and respected engineers pass out from the active ranks without paying a proper tribute to his skill, energy, industry and honesty; consequently at the September meeting of that society it was unanimously resolved, "That the Guild of Gas Managers tender to Mr. Geo. D. Cabot a complimentary dinner, to be served at the Parker House, Boston, on the eighth day of October; and that the President, Col. Wm. A. Stedman, with such others as he may select, be appointed a committee to carry the necessary arrangements into effect."

With the incentive before the Committee resolving itself into an effort to do honor to one who had lived amongst them all his life, and who, because he had reached to that period where he found it but simple justice to himself to seek relief from the cares and responsibilities incumbent upon the faithful manager of a business that demands such constant watchfulness and vigilance as do the operations of gas manufacture and distribution, it is little to be wondered at that the pleasing duty intrusted to their charge was most agreeably and successfully performed, as those who were present on the delightful occasion can bear ample witness to.

Promptly at three o'clock on the day named the guest of the occasion, with the friends and members of the Guild, seated themselves before the tastefully arranged tables. Those present included the honored guest, Mr. Geo. D. Cabot, Col. W. A. Stedman, Messrs. L. P. Gerould and son, S. G. Stiness, J. F. Rogers, A. D. Perry, O. E. Cushing, W. A. Durfee, C. F. Spaulding, H. B. Leach, Geo. B. Neal, John Andrew, J. H. Rollins, and A. B. Slater, all of the Guild of Gas Managers; with Messrs. Fred. J. Davis, of the Davis & Farnum Manufacturing Company; Nathaniel Tufts, C. H. Sprague, and son, F. H. Odiorne, M. S. Greenough, Boston; and C. W. Isbell, of the Smith and Sayre Manufacturing Company, of New York City, as specially invited guests.

Col. Stedman presided, and at his right was seated the one whom all present had assembled to honor. The well-known attainments of the Parker House *chef* render unnecessary any comments here upon the excellence of the *menu*, or the superiority of the service—neither could have been surpassed.

All the gentlemen present vied with one another in giving utterance to their expressions of respect, personal regard, kindly feelings and good wishes for Mr. Cabot, and indeed it was an occasion long to be treasured up in the memories of those who had the good fortune to be in attendance. More especially will the recollection of those golden hours of friendship be treasured up by Mr. Cabot; for when a man has attained the 73d year of his age, and on an occasion like this, when in the midst of his immediate friends who had known him as well under all the trying vicissitudes of daily life, he hears them all without a single exception give expression to sentiments conveying their honest testimony to his upright character, to his long, honorable and useful course amongst them, such utterances could not fail to excite within the breast of any man a feeling of just pride, and recompense him to the full for many a weary hour of former trial. Long may Mr. Cabot live to enjoy the remembrance of that pleasant afternoon in which he listened to what the voice of earnest friendship placed on record as the fitting tribute to his worth, and may many years of ease and comfort now enable him to reap the just reward, and completely and harmoniously round out what has always been an honorable career.

Letters were read from Mr. F. C. Sherman, of New Haven, Conn., and Mr. John T. Langford, of Boston, Mass., regretting their inability to attend; and their messages also gave full and free expression to the same sentiments that were so earnestly expressed at the banquet by the members and guests of the Guild of Gas Managers.

A New Diffusion Lantern.

The London *Journal* notes that an attempt has been made by Mr. A. P. Trotter to construct lanterns which shall diffuse and distribute powerful lights, such as that of the electric arc, without incurring the loss entailed by the use of opal glass. This was done with certain lamps fixed at the Health Exhibition, by a special modification of prismatic lenses (such as are used for lighthouses), adapted for ordinary lanterns. The general shape of the lanterns is that of the more improved street lanterns for powerful gas flames—an inverted cone closed at the top by an opal glass cap in the form of a much flatter cone. The glazing of the latter, however, instead of being with plain glass is with specially moulded panes, bearing on them a number of prisms at ¼-inch pitch. The prisms are formed on both sides of the glass, those on the front being horizontal, and those at the back running vertically. The effect is to break up the light source into a multitude of images of itself; care being taken that the angle of the prisms does not give a chromatic effect. Each pane so formed, for a 2 ft. 6 in. lantern, is 14 inches long, tapering from 8 inches wide at the top to 2 inches at the bottom; and ten of these go to form the lantern. It is claimed that the absorption of light by such a lantern is only 10 or 15 per cent., as against 40 to 60 per cent. with ground or opal glass.

[Official Report.—Continued from page 261.]

Twelfth Annual Meeting of the American Gas Light Association.

Held at Willard's Hall, Washington, D. C., Oct. 15, 16, and 17.

First Day, Afternoon Session—Wednesday, Oct. 15.

The President called upon Mr. E. McMillin of Columbus, Ohio, to read his paper entitled

NOTES ON THE CHEMISTRY OF GAS MAKING.

In presenting this paper to the Association I have no thought of startling you with any new discoveries, and perhaps shall say nothing with which most of you are not now familiar; but if I can only awaken a little interest in the mind of some member who is competent to more fully investigate the points here only reconoitered, and that member shall at a future date give us something worthy of our calling, I shall have fully accomplished my purpose.

While I have given the questions here discussed a great deal of thought, and spent much time in their investigation, yet I regret that it did not occur to me to write on this subject until last week, and I then found myself too busy to be able to put the matter in a very readable shape, or to look up authorities, as I should and would have done had more time been at my command.

One of the troublesome compounds which both water gas and coal gas makers have to contend with is carbonic acid. The question of the removal of this impurity has cost the gas fraternity much thought and vast sums of money. Yet with all this expenditure of time and money we stand to-day where our predecessors stood—relying on the use of hydrate of lime for the removal of carbonic acid, or otherwise leaving it in the gas and, by the use of enrichers, making up for any apparent depreciation of the illuminating power. I personally know of but one exception to this rule—that of the Ann Arbor (Mich.) gas works. There Prof. Douglas succeeds in removing CO_2 by, as he supposes, occlusion in the earthy matter contained in a form of oxide of iron that he uses. Now, would it not be wise for us to investigate a little, and see if it is not cheaper to prevent the manufacture of this impurity than it is to remove it?

About the strongest argument the coal gas man has to present respecting the superiority of his product over that of the water gas, is the small per cent., comparatively speaking, of carbonic oxide in coal gas. But the percentage is not so small after all—anywhere from 4 to 12 per cent. Now, if the 25 to 35 per cent. of carbonic oxide is objectionable in water gas, the 4 to 12 per cent. in coal gas must also be objectionable, only in a less degree.

We all can readily understand how this compound is formed when generating water gas. When steam is decomposed by incandescent carbon, about one-half of the volume of gas made will be CO. The proportion is afterward reduced by the introduction of the gas from the enriching substance. Now, do we so readily understand from whence comes our (say) 7.5 per cent. carbonic oxide in coal gas?

In selecting coals for gas making we are all careful to avoid coal containing a large per cent. of sulphur. But do we ever have the samples tested with a view of ascertaining the per cent. of oxygen? The gas works with which I am associated have experimented with a great many coals during the last year, and the ultimate analyses showed oxygen in these coals varying from 3 to 18.5 per cent. of the total weight. The latter figure looks large, and doubtless many of you are, like myself, a little skeptical respecting ultimate analyses of coal, owing to the fact that oxygen can only be ascertained by difference. But in practice we find that the quantity of oxygen present is quite as large, and varies quite as much, as the ultimate analyses indicate.

Now, while few give this question of oxygen in coal any thought, all strive for a coal low in sulphur. Yet, if I had my choice to have the sulphur reduced one-half or the oxygen reduced in a like proportion, I should certainly accept the latter favor in preference to the former.

The form in which oxygen exists in coal is a question that has not been satisfactorily answered. Most authorities, I think, agree that it is present as water, either combined or hygroscopic; but as none of them are positive in their opinions, I will perhaps be pardoned for saying I do not believe that all oxygen is present in coal in the form of water, but that it is there partly as water, mostly in the form of compounds not unlike those holding it in woody fiber or vegetable matter, and a very small portion held by occlusion.

The average of 35 analyses of coal (the average made from tables given in "King's Treatise") give the following results: Carbon, 79.09; hydrogen, 5.32; nitrogen, 1.08; sulphur, 1.59; oxygen, 8.22; ash, 4.70. Per cent. of coke, 65.50. It is plain from this average that but a small per cent. of oxygen is present in the coal as air; but the total oxygen is not large.

The ultimate analyses of a great number of samples of an Ohio coal that is extensively used in gas works, gives an average of 17.12 per cent. of oxygen; yet these same samples only gave an average of 7.26 per cent. of moisture. Now, from a number of analyses made of the gas generated from this coal (the gas before analysis having been passed through both oxide of iron and hydrate of lime—the latter supposed to be fouled, and used only to remove tarry matter), we obtained the following results:

NH_3	SH_2	CS_2	CO_2	Illuminants.	O	CO
.08	.08	.25	3.33	4.33	.58	9.58

A Pittsburgh coal that contained only .90 per cent. of moisture and 7.08 per cent. of oxygen, produced gas that from a series of analyses gave the following results:

NH_3	SH_2	CS_2	CO_2	Illuminants.	O	CO
.50	.80	.25	1.45	4.35	.65	4.00

You will observe that carbonic acid and carbonic oxide are found in the gas in almost identically the same proportion in which the oxygen is found in the coal. In testing the gas from the Pittsburgh coal, the gas was taken off near the retort, and passed through a small vessel filled with cotton; but it did not pass through either oxide of iron or lime. In making the tests samples were taken twenty-five minutes after the charge was put in the retort; again in two hours after charging; and again in 3¼ hours after charging a four-hour charge.

Previous to making these tests I was under the impression that there was a larger per cent. of CO_2 and CO generated at or near the end of the charge than at the beginning; and I find that this is a common impression among gas men. This idea has doubtless grown out of the fact that gas of poor illuminating power is given off during the latter stages of the charge. These analyses show that at end of first half hour the CO_2 averages three per cent., and that during the last half hour it averages but 1.08 per cent. The CO at end of first half hour averages 7.25 per cent., and during last half hour it averages 4.17 per cent. These averages were made up from the tests made both from the Pittsburgh and Ohio coals. Samples taken about one hour and a half after a four-hour charge is introduced into the retorts will show these compounds present in about the same proportion that they are found when a sample is taken from the gas of the entire charge.

But the formation of these carbon compounds is by no means the only objection that can be raised against the use of coal containing a large per cent. of oxygen. In fact not more than thirty per cent. of the oxygen is taken up in this way.

The Ohio coal from which these tests were made yielded about 8,000 feet of gas per net ton of coal. The whole of the oxygen doubtless passes off from the coal in the retort, and possibly even more than is shown by the analysis, as a portion of the ash may be partially reduced. Now, 17.12 per cent. of 2,000 pounds equals 342.40 pounds, which sum represents the weight of oxygen in a ton of this coal. The oxygen in combination with CO_2 and CO in the 8,000 feet of gas from this coal will weigh about 100 lbs. The free oxygen in the gas (.58 per cent.) will weigh a little over six pounds. Then we have 342 pounds less 100+6 pounds, which equals 236 pounds of oxygen that must be driven from the retort mostly as water; for a comparatively small per cent. of the oxygen will be combined with the oxygenated compounds of the coal tar. In using this class of coal we have found it necessary to run fully fifty per cent. more water through our multitubular condensers than is required with Pittsburgh coal, in order to cool the gas down to the desired temperature—the condensers being made hot by the condensation of the water vapor.

The volatile matter is greater in the Ohio coal producing 8,000 feet per ton than in the Pittsburgh that produces 10,000 feet to the net ton. Of course, it is much more difficult to keep up heats; or, in other words, to maintain heats it requires much more coke per 1,000 feet of gas made.

A majority of the gas works represented here to-day doubtless use coal from the Youghiogheny gas coal basin, and to such these remarks can have little application; but there are others here who use local coals, or coals that are bought for their apparent cheapness, and to such I would suggest that it would be well not to lose sight of this question of the chemical composition of their coals, and to avoid those containing a large per cent. of oxygen.

Some authorities attribute the large per cent. of CO_2 and CO present in coal gas to over-exhaustion, which would draw these gases into the retorts from the furnaces. Were this assumption correct the per cent. of nitrogen drawn into the retorts would be much larger than the aggregate quantity of both CO_2 and CO.

The samples of gas taken for analysis (the results of which are given in this paper) were not drawn off by an exhauster; neither were they permitted to pass through any water or tar seal; but were driven out of the retort against a holder pressure of one and a half inches.

When Mr. McMillin had finished reading, on motion of Mr. Helme, a vote of thanks was tendered to the author for his instructive communication.

Discussion.

The President—I have put this motion with a great deal of pleasure, because I think Mr. McMillin has succeeded in presenting an extremely interesting series of statements; and has shown us the way by which we may

make profitable researches into the minutiæ of our business. It would pay us all were we to make similar researches, provided we could spare the requisite time; but in default of our having the desired leisure, we are of course bound to acknowledge our indebtedness to the gentlemen who make these investigations for us.

Mr. McMillin will be very glad to answer any questions that you may desire to ask. We shall be very glad to have the matter discussed, if gentlemen desire any more information than the paper itself conveys.

Mr. E. McMillin—This is a paper, perhaps, not calculated to provoke much of a discussion, because its topics are of a nature calculated to be quietly thought over in order that they may be intelligently canvassed. There is one other statement I would like to add to that which I have read and that is—if you will calculate the number of feet of watery vapor which is passing off as oxygen, you will find that when using certain classes of coal, and only making 8,000 feet of gas per ton, there will be driven off almost as many cubic feet of watery vapor as of coal gas.

The President—I would like to ask if you suppose that nearly all the oxygen is originally contained in the coal as water?

Mr. McMillin—I think not. I take the ground in my paper that the oxygen did not exist therein in the form of water. The ultimate analysis of the coal only shows about seven per cent. of moisture. Chemists tell us that you have to reach up to five, six or seven hundred degrees in order to get all the water out. The question then is, are you driving off the water, or are you driving off the hydrogen and oxygen, which at that temperature combines to make water? The position I take in regard thereto is this—it exists there in a compound state, and not as water, and that the carbonic oxide and the carbonic acid will be in proportion to the percentage of oxygen contained in the coal. Many of the light coals in use in this country really contain a remarkable proportion of water. In one description of the Ohio coals formerly used by us we obtained as water 15 or 20 per cent. of any given weight or charge carbonized; and that was in addition to the quantity obtained in the form of impurities. We do not use that sort of coal now.

Mr. James M. Starr—Do you suppose that the water found in the dripboxes is a portion of that which is driven off with the gas during carbonization?

Mr. McMillin—My opinion as to that would be, no matter what sort of coal was used you would have about the same percentage of water in your drips. The gas resting over the water in the holder tank will, at a certain temperature, carry just so much moisture, no matter whether the volume so contained went into the holder with the gas, or was afterwards absorbed. Gas will take up two per cent. of moisture at a temperature of 40°; and at a temperature of 80° it will carry three per cent.

Mr. T. Littlehales—I think it is pretty evident the moisture that the gas takes from the tank settles in the drips. I have known of one or two cases where the purifier was put on outlet of holder, with the result that there was hardly any condensation whatever in the mains. This shows that the gas absorbs from the tank a large portion of water, and proves where the moisture comes from that settles in the drips. If the gas were thoroughly dry, of course there could be no such thing as condensation.

Mr. William Helme—Mr. Littlehales, what was that purifier charged with?

Mr. Littlehales—In the case mentioned by me unslacked lime was the material employed.

Mr. Helme—How often did it require to be changed?

Mr. Littlehales—It will be effective for quite a lengthy period.

The President—If there are no further remarks to be made on this subject, I will request Mr. G. A. Hyde, of Cleveland, Ohio, to read his paper on

COATING GAS MAINS WITH COAL GAS TAR.

The practice of coating the outside of distributing mains with coal tar has been in vogue for very many years; but the dipping of such mains, thus ensuring the covering of every portion of the pipe, both on the outside and internally, is a method more recently practiced.

Tar coating was originally applied to the conduits intended as distribution mains for water companies; but manufacturers have within the last three or four years, unless otherwise directed, indiscriminately filled their orders by supplying the coated pipe.

Recently my attention has been directed to the destructive action of coal and naphtha gas upon the coal tar coating in the pipe, and also at the joints. This action has been of so serious a nature that I thought it advisable to bring it before the attention of the Association, to the end that the members might be put on their guard.

The gas coming in contact with the tar coating softens or dissolves it, and, when brought to a sufficiently liquid state, it runs along the main to the first convenient drip, where its deposit or collection causes a vast amount of annoyance, as it is not easily pumped therefrom without having been reduced to a sufficiently liquid condition by admixture with naphtha. Bothersome as this condition of things undoubtedly is, we yet have a still more serious state of affairs traceable to the same cause—leaky joints. In pouring the lead at the time of making the joints the tar is melted, and, being lighter than the lead, is carried to the upper portion of the joint, and prevents a perfect union between the lead and the face of the iron pipe. As soon as the gas is let into the pipe the action of softening commences, and, in due course of time—depending on whether there is little or much benzine in the gas—the tar is softened right through to the outer face of the leaden joint, and then occurs a leak which in length is about one-fourth of the circumference of the pipe, but always at its top section.

On motion of Mr. Starr, seconded by Mr. Knowles, a vote of thanks was tendered to Mr. Hyde.

Discussion.

Mr. J. H. Knowles—I think that the paper just read is true to the letter. I am running 20-inch mains now, and have to coat the pipe. I have been annoyed a great deal through the behavior of the inside coating.

Mr. George D. Cabot—Some ten or twelve years ago I was very much impressed with a fact stated in Mr. Hyde's paper. In the season following the one when I had first laid the tarred mains I found that the whole of the coating was taken off by the action of the ammoniacal liquor. It was a cause of very great annoyance to us. I will ask whether anyone else has had just that experience.

Mr. James M. Starr—I can testify to the fallacy of tar coated pipes. I would not put it on a single joint now. I always inquire if the pipe is uncoated; but it appears that the manufacturers *will* send coated "tees" and "crosses." I always go to the trouble of even burning these out rather than using them. Twenty years ago I made up my mind to try the "Robin's joint" coated pipe; as a result I had to open the mains at every joint. When repairing the joints the leaking gas, on ignition, would burn in a sheet of flame clear round the pipe, showing that the coating had been eaten off all around. The fact of the flame burning in that manner was conclusive evidence to my mind that the tar had been eaten away. In some cases where it had eaten through the lead the leak would exist at one point only; but in almost all defective places the joints leaked all around. Indeed, our leakage was frightful; we would make 200,000 cubic feet and sell but 100,000.

Mr. J. P. Harbison—Have you had any experience in leaking all round the joints except with the so-called "Robins joint?"

Mr. Starr—I have had no experience with any other tarred pipe save the "Robins joint;" consequently I cannot say anything about the other descriptions.

Mr. Cabot—I took the precaution, before I laid the pipe, to "bite" the joint in solder.

The President—Did you use a cement joint?

Mr. D. Cabot—No, sir; the tar would affect the cement to such an extent that we could not put together a tight joint. We burned out the end of each pipe before we made the joint.

Mr. C. H. Nettleton—I have recently had occasion to take up quite a long line of 6-inch gas main that was laid in 1871. It was laid through a clean, sandy soil where apparently there was no foreign mixture, yet, when the pipe was taken up, it was very thickly covered with rust; and in places the iron was very soft, so soft, in fact, that you could pick it with your knife. In connection with gas works I have charge of water works, and I have had occasion to take up water mains that had been tarred over. I have never yet found any tarred water pipe that was not perfectly hard, and with only small spots of rust here and there on the outside. It has occurred to me that if there was some way by which we could cheaply coat the outside of gas mains it would add to their life. As bearing upon that point I might relate an incident in my experience in connection with water works. Two water pipes of different sizes were connected by a reducer—the latter was not tarred. After the water had run through this line of pipe about five years the reducer was taken out and found to be coated with rust ¾ inches in depth on the inside, while the tar coated pipe alongside of it had scarcely a particle of rust. This showed the particular efficacy of this tar coating to prevent rust in water pipes. If we could only manage to have our gas pipes covered with this tar coating on the outside, I believe they would last indefinitely.

Mr. Harbison—Was that pipe of lead or of cast iron?

Mr. Nettleton—Of cast iron.

Mr. G. S. Page—I have had a wide experience in the sale of many thousand barrels of the *coal tar cement* which pipe makers have been using instead of coal tar; and this fact will explain the difficulty to which reference has been made by Mr. Hyde. I suppose that all the members have visited pipe works, and know how the pipes are coated. They are heated and dropped into a tank of tar; and as the pipes are open at both ends they are, of course, coated both on the inside and outside. In the extraction of benzole, naphtha and light oils of the tar, which practice all our distillers follow now (these being more valuable than any other of the products), they carry the distillation far enough to take out the heavy oil also; and many of them carry it to

a point of taking out the anthracene oil and leaving only hard pitch. In the large tar works which supply the pipe works with cement, this hard pitch is kept liquid by adding to it some of the heavy oils, but none of the light oils. This makes a product which runs about as cold molasses would from a barrel; and so, when the pipe is brought into the tank containing this cement, a thicker coating adheres than there would if it were thin coal tar, or pitch containing the lighter oils. Hence, in joining the pipes, when the lead is put in the pitch is softened. The pitch is left in the ends of the pipe, and the result must be just what has been stated. Mr. Nettleton has suggested a plan which I think it would be wise to adopt, and that is for all users of gas pipes to go to the parties from whom they buy their pipes and carefully inspect the way in which they are coated. I do not see how there can be corrosion on the interior of the pipe unless oxygen is admitted; and I do not believe that many of the gentlemen present desire to sell much oxygen with their gas. If the pipe maker would put a plug in the ends of his pipe before plunging it in the tank, there could be no coating on the inside; and if you would insist upon their using coal tar of a proper consistency, you would get a much better coating on the outside than is possible by the use of this cement coating made of hard pitch and heavy oils. It would last much longer and be much more effective. I presume, in the present state of the coal tar market, that is a point which could be impressed upon the pipe makers.

Mr. E. McMillin—I understand that Mr. Hyde's trouble was with the outside of the pipes.

Mr. Hyde—Yes; with the spigot end.

Mr. Harbison—Do we understand from Mr. Hyde that his pipe was coated only on the outside.

Mr. Hyde—This pipe was dipped pipe, every part of it inside and outside being coated; and it would not be possible to dip that pipe without getting tar on the spigot end. That is the disastrous part of it. You might get along with the melting of the tar in the pipe; but if, when you join your pipe, you have to go over the ground again it becomes a very serious matter.

Mr. Butterworth—My experience coincides entirely with that of Mr. Hyde. For the last eight or ten years I have used no dipped pipes. In every instance where I did use them leaks occurred, and they had to be dug out. Three years ago, when laying a line of mains, I ran short, by a few lengths, of the desired quantity; to make up the deficit I borrowed from the water works a few lengths (it was coated pipe) and put it in. About three-quarters of a mile of that line of main was laid with pipe that had not been dipped; and the only leakage that occurred happened in the section laid with the coated pipe. There will always be a slight space left after the tar has been burned away where the joint will leak.

Mr. Starr—I do not think that Mr. Page's idea of placing a plug in the ends of the pipe when dipping them would answer the purpose, since this would allow of the tarring of the outside of the spigot—and there is where the leak occurs. If parties who desire to protect their pipe would, after its delivery on the ground, paint all of it on the outside up to, say, within a foot of the end, and then paint right around where the caulking is done, it would save trouble and could be done easily. I paint all my pipes in that way so as to cover the lead joint.

Mr. O. B. Weber—Mr. Roebling, the engineer of the Brooklyn Bridge, when he came to covering the wires that hold the span, did not use tar at all, owing to the fact that tar corroded the wire too greatly, but used white lead instead. At the Pittsburgh Bridge all the tar has been removed, and white lead substituted in its place. Mr. Roebling remarked to me that he thought the tar had such a strong affinity for the iron as to destroy it. He showed me a specimen where it had eaten in half an inch in a 3-inch coil.

Mr. Robert Baxter—I will state, for the benefit of those who desire to know a method of coating pipes with tar, the way we do it at our works. Before coating the pipes I heat them with steam. I have a wooden plug on the end of the steam pipe, and another wooden plug for the gas pipe. I turn on the steam, heat the pipe, and while it is hot paint on the tar. All of our new pipes are turned; and, of course, we do not tar the turned part. If we tar any of the old pipes which have spigot ends, we leave three or four inches untarred. When the pipe becomes cold the tar is dry, and, as far as my experience goes, it makes a tight joint. A few weeks ago I tried the same plan with a lot of iron pipes intended for services. I kept the steam on for about an hour and a half, baking the coating thoroughly on, and it made a really good job. We can both cut and screw this pipe without the tar scaling off. Of course, I cannot report this as the result of a long experience, since it really is comparatively new with me; but I intend to continue the operation long enough to give it a fair trial. I may say that some years ago at my works I had a large section of main laid with 14-inch pipe which was coated both inside and out, and had the same trouble happen with that section as was alluded to in the paper—that of the tar filling the drips. There was no leakage from the joints, but still it was the last lot of pipe of that description used by us. All of our pipes are now coated with tar in the way that I have described, and I find it a very efficient system indeed.

Mr. Hyde—At East Saginaw, Mich., for the last two or three years, they have been painting service pipes in the way described by Mr. Baxter. This permits the tar to permeate every possible scale of the iron, and instantly makes a thoroughly glossy coating. It has not been tried long enough to know what the final result will be. The method has been followed only during the last three years, and a positive verdict cannot yet be rendered, but it gives now every indication of success.

Mr. Littlehales—For the last seven years every foot of service pipe which we have laid has been painted in that same way. I have carefully followed up the result, and have opened the same services year after year for the purpose of noting the effect. Some of the services that have now been down for seven years are as clean as they were the day when first laid. I am perfectly certain that the results of the practice infinitely more than repays the cost incurred for labor. I have figured out the cost as closely as possible, and find that it amounts to about one-quarter of a cent per foot. In testing them you have this advantage—if there happens to be any imperfect welding you can discover it. We also do the same with our cast iron pipes. I do not care where they come from, or how carefully the foundry tests are made, defective pipes are often forwarded. We have had some delivered from the best makers in the country, but have never yet had a consignment in which there was not included more than one leaky pipe. I have had pipes with holes in them in which you could insert your finger; yet they had been passed as tested. The absence of leakage from such pipes in three months would more than repay the cost of testing and coating. I am perfectly certain that service pipes will last for ten or fifteen years under this process.

Mr. McMillin—I have been coating service pipes for the last thirteen years with a mixture of coal tar and turpentine. I do not use any heat in putting on the mixture, but give it time to dry thoroughly before placing the pipe in the ground. About two years ago I found a leak existing in an inch and a quarter serviee pipe, about four months after it had been placed in position. In fact it had been eaten away till it resembled a honeycomb. Upon investigating the matter the men acknowledged that it had been put in in an uncoated state. That shows the difference in the comparative lasting of wrought iron pipe, coated and uncoated.

Mr. Hyde—Did the coating prevent oxidation?

Mr. McMillin—It protects the pipe from the action of sulphur. It is very hard to protect a wrought iron pipe from the action of sulphur when it is laid in cinder, as the pipe to which I have referred was laid.

Mr. Hyde—In Cleveland, Ohio, we have found considerable difficulty with cinder. Our service pipes, when laid in cinder, were very quickly rusted through, honeycombed and destroyed. We are now laying the pipe in cement, making a trough big enough to hold the service, then filling in the cement, thus covering the pipe entirely. We could not find any tar or paint that would prevent the rusting out of services laid in cinder; but we found the plan mentioned to be a sure cure.

Mr. McMillin—The best thing that I have found for that is to use coal tar pitch. It will answer the purpose; but you must be careful not to use pitch that is too hard.

Mr. E. Lindsley—Some six or seven years ago, to the east side of our town was built what is called the "Viaduct"—some 2,500 or 2,600 feet long. We laid a gas main there just to supply the lights for that bridge or viaduct. I placed the pipe in a box one inch larger in square section than the diameter of the pipe, placing some strips beneath, and securing it by little wedges in the sides, leaving about half an inch all round, and then filled that space up with pitch. The pipe lies right on a stone ledge—or a course of stone which projects about 8 inches inward—and is 22 inches from the top. On that ledge this pipe is laid. It is therefore about 22 inches from daylight in that direction; and as it passes under the arches it is about 22 inches from daylight there. I have yet to have any corrosion, and have yet to find the first leak in any portion of the pipe.

Mr. Page—There is no question about the preservative qualities of pitch as a protection for iron. In 1870, in Paris, France, I saw gas mains, manufactured of sizes up to 24 inches in diameter, coated on the exterior with pitch, and then, before the pitch was cold, they were rolled in fine gravel. Recently, in Minnesota, I passed a factory where they are making the same kind of pipe. I should suppose that the cement used by Mr. Hyde would be cheaper than pitch, as pitch is worth $10 per ton, and the cement would be worth something less than that.

The President—If there is no further discussion on this topic we will now listen to the reading of the next paper.

Mr. H. F. Coggshall, of Fitchburg, Mass., then read the following paper on

PURIFICATION WITH IRON.—FIVE YEARS' EXPERIENCE IN THE USE OF CONNELLY'S IRON SPONGE FOR THE PURIFICATION OF GAS.

In presenting to you the results of my experience in the use of iron sponge, so called, I am aware that it is one of the subjects that will show in its economic results so small a gain in the matter of dollars and cents that it

will interest but few of the members of this Association; and if it were not for the fact that there are some works represented here similar in size to my own, that will be interested in any subject presented tending to lessen the cost of production, however little, I should not intrude myself upon your attention.

In the fall of 1879 I purchased of Connelly & Co. 375 bushels of iron sponge. On the 1st day of December, 1879, I commenced its use, charging one of my purifying boxes with 70 bushels. The size of boxes is 6 by 10 feet, and 32 inches deep. Upon the lowest offset for receiving the screens I placed plank 1¼ inches thick, filled with half-inch holes, leaving one inch space from outside to outside of hole. Upon this I placed the sponge well wetted, filling the box full.

The results obtained were:—With the first box of sponge and two of lime, I passed 4,552 feet to the bushel. Two of sponge and one of lime, 3,545 feet. Three of sponge, 2,450 feet.

The number of feet run on the following charge were, respectively, 2,180, 2,000, 4,150, 4,350, 4,921, 5,360, 8,025, 8,000, 10,200, and 13,900; then running along at about 13,000 for a lengthy period without any falling off in the amount of gas purified. I am still using the same material as at first. The amount of gas purified up to October 13, 1884, was 51,389,000 feet, or 137,000 feet per bushel.

When we commenced using the sponge we were working with ammoniacal liquor in the first chamber, and pure water in the last chamber of the scrubber. I soon found I was having more carbonic acid than before, and also showing a decrease in candle power. At the suggestion of Mr. Connelly I shut off the pure water, and the candle power ran up to 16.80 without any enricher—this from Youghiogheny coal. I have used no pure water since.

From my own experience I am satisfied that equally good results will be obtained by everyone in the use of iron sponge, if they will comply with the following conditions:

1st. There should be ample quantity of material to give time for revivification between the charges. I had sufficient for six boxes of similar size to my own, as the increase in bulk, after first using, is quite large.

2d. All tar must be eliminated from the gas before passing to the boxes. This is very important.

3d. The boxes should be large enough to allow the gas to pass through slowly, in order to obtain the best results, as I found that, in passing 40,000 feet in 24 hours my runs were from 100,000 to 130,000 feet more than when I was passing 65,000 in 24 hours. This, of course, applies as well to lime purification.

4th. Plenty of air for revivification.

Complying with the above, I believe that everyone will be satisfied with the results.

The advantages obtained are—

Reducing the cost per 1,000 feet with the new material by 50 per cent.

Reducing the cost of labor 50 per cent., as the time required for charging, clearing, and preparing is no more than with lime. As proof of this, in November of '79, using the same coal and purifying with lime, I was passing to each box 220,000, 200,000, 217,600, and 216,000 cubic feet. After using the same lot of iron sponge for four years and a half, I am passing through 503,000, 477,000, and 433,000 cubic feet.

Last, but not least—doing away with the gas lime nuisance.

Now if, from the statement of the above results, some member of this Association is enabled to reduce his cost of manufacture, my object is attained.

On motion of Mr. Helme, a vote of thanks was tendered to Mr. Coggshall.

Discussion.

The President—This is an eminently practical subject, and is one on which we ought to have a thoroughly good discussion. There are plenty of members present who have tried iron sponge in various forms, and who can compare notes with one another to our very great advantage. I have never yet tried iron sponge in any form. We who are on the borders of Narragansett Bay have such an abundance of oyster shells at a nominal cost (having only to burn them with our breeze and the finest dust that we get from the coke, and with the expenditure of very little labor), that we can make lime so cheaply that it hardly seems worth while for us to change, except it be to do away with the nuisance which the spent lime creates. But I am aware many are so situated that the expense of the lime is quite an item in the economy of manufacture; and as there are several gentlemen with us who have made a thorough trial of the different methods of iron purification, we would all be glad to learn all that we can about the subject.

Mr. Wm. Helme—I would like to inquire of Mr. Coggshall if he has run the material out until the sponge was entirely exhausted or worthless, and then figured out what it had cost him.

Mr. Coggshall—I have not run it long enough yet to make it entirely worthless.

Mr. Helme—You have been running it for four years?

Mr. Coggshall—It will be five years on the 1st of next December. I will say, in relation to the lime nuisance, that at a short distance from my works is one of the streets of Fitchburg on which there are some very fine residences; and when the wind was in the west the effluvia from the fouled lime was carried to those houses, and was a source of very great complaint. The gas company was sued for a nuisance on account of this very matter.

Mr. Helme—A gentleman who has been using the iron sponge for some time, and watching the thing pretty closely, and managing it, as I think, very intelligently, said that after he had passed 85,000 feet to the bushel through it it was not worth much to him. Now, if he had paid 85 cents per bushel for it (which he did not do), that would have made the cost only one cent per thousand feet. He really paid for it about 60 cents per bushel. That is cheaper than lime would be in most places. We bought some six or eight hundred bushels to be shipped to Atlanta, Ga., and by using a little sawdust and lime in the bottoms of the trays it was found to work very satisfactorily. We have not yet got to the point where we consider it exhausted; and therefore, while we are satisfied that we are saving something by its use, and especially a good deal of labor and trouble, we do not yet know how much *money* we are saving. That is a point which we all want to know about. My friend Boardman is operating a works at Macon, Ga., where he is using this material under greater advantages than we are, by reason of the fact that he has two distinct sets of purifiers.

Mr. A. E. Boardman—I have four sets—two for iron and two for lime.

Mr. Helme—I suppose that, freight and all, the sponge costs Mr. Boardman about 70 cents. That is about what ours costs us. I would like to have a statement of his experience in the use of the iron sponge. He has watched the thing closely, and has used it, I think, under the most advantageous system—that of having separate purifiers for the lime and the sponge.

Mr. Boardman—I will state in brief what my experience has been. When I first got the sponge I was greatly troubled to get lime enough to purify my gas. Noticing an advertisement of this sponge material, I bought a sufficient quantity to use in four of my purifiers. The works are rather small for the make we are sending out. The first lot of sponge that I received lasted me only about eighteen months; it then became so foul that I could not use it to advantage; and as we were at the time moving into larger works I obtained a fresh supply. During that period I had saved three or four times the cost of the sponge over what I had been paying for stone lime—which is the only lime that we can get at that distance from the seaboard. I averaged, on the entire lot, about six thousand feet to the bushel each time I tried it until at last it gotdown to purifying only two thousand feet to the bushel, when I got a fresh supply. The failing to purify was due not alone to the formation of fresh sulphur in the iron sponge, but it also became coated with the tar which went over (my scrubbers and condensers not being sufficiently large to throw it down), thus rendering it worthless. I then bought sufficient sponge to run my new plant, which is on a much larger plan than the old one—having 10 by 10 purifiers, I have been using the last lot purchased ever since (more than two years now), and I am at present purifying at the rate of between seven and eight thousand cubic feet to the bushel. It is not yet exhausted; in fact it has not shown any signs of exhaustion. It is doing better now than it did for the first few months after buying it. I also tried another experiment, being led thereto when I found out what caused the want of efficiency in the discarded lot. Having some retorts out of use I put that sponge in an reburned it. It reduced the bulk very largely, as all the sawdust which was mixed with it was consumed. I then took it out, and, after cooling it, added a certain proportion of lime and sawdust to bring it to its original state. Since then I have attempted to use it. The only difficulty I now find with it is that it revivifies too easily, and I have had several cases of spontaneous combustion. I believe the material is practically indestructible, if used with proper precaution. I found, on one occasion, that in passing a large quantity of gas through the sponge I got an excess of moisture; in fact, on looking into the matter I discovered that the condensation going over was so great as to moisten the lower layer too much. I then interposed a screen of sawdust, and have had no trouble since. Before employing the screen of sawdust I had to change my boxes once a week, while now, even at this season, I require to change only once in three weeks, and in the summer season but once in four weeks. I had some difficulty in extracting the carbonic acid from the gas. If I did not feed water enough to the scrubber I was also very apt to get a little tar, which was, of course, detrimental. I am now running the four purifiers with iron sponge, and after passing it through three of them I pass it through two that are filled with lime. I find that this is a great benefit both to the gas and the sponge. I purify more gas with the sponge, and I also purify 32,000 to 33,000 feet of gas per bushel of lime. When the lime is taken out it has scarcely a trace of sulphur; and I suppose that if more care were taken to change, as soon as the middle purifier was fouled, we would have no trace of sulphur at all. But even as it is there is no nuisance from it. I would unhesitatingly recommend the iron sponge to all engineers residing in the interior.

Mr. J. Anderson—In connection with this I will mention that in our new works we have adopted a very simple method of keeping the sponge in the box; but I cannot state yet whether it will be a success or not.

Mr. G. B. Neal—My experience in the use of iron sponge is not precisely like that related by Mr. Coggshall. I have used that material for purifying (without lime) for nearly four years. The first lot that I purchased lasted about two years before it became worthless. Acting upon Mr. Coggshall's suggestion, I employed lime with the sponge, as he has done, but not with very good results. At the end of about two years the initial lot of sponge was discarded. Then I purchased a new consignment of sponge which, at the beginning, seemed to work very well. In some instances I purified as large a quantity as 18,000 feet to the bushel before revivification became necessary. The material since has been gradually lowering or decreasing in purifying power until it will now purify only three or four thousand feet per bushel. I am perfectly satisfied with it even at that. The labor of revivifying is very small. It is taken out of the boxes and spread on the floor, turned over once or twice, and, after remaining exposed for a certain length of time, is put back again in thorough condition for use. I use sawdust on the bottom screen in purifiers, and place over the sawdust the gunny bags in which the sponge was transported to my works. This is done to keep the iron sponge from mixing with the sawdust, and preventing waste. When we clear the sawdust out there is very little iron sponge mixed with it. The sawdust is changed but very seldom. The ammonia present, as shown by test of our State Inspector, is always a trifling matter. The sulphur has varied, and at times has reached to over twenty grains. Twice I have been in danger of being held liable to a fine of $100, because of this excess of sulphur; still I may note that that state of affairs was owing to the sort of coal carbonized. When I changed the coal there was no further trouble from sulphur excess. I have had as low as six grains of sulphur in a test, and sometimes as high as sixteen. There is no difficulty in removing the sulphur. With regard to the carbonic acid, I am told by our State Inspector that the tests sometimes show the presence of carbonic acid, which certainly lowers the candle power. I do not lay any great stress on that, since I find that, without the use of an enricher, I am making five feet or more to the pound, and the inspector's tests invariably show an illuminating power of over sixteen candles.

Mr. McMillin—What coal do you use?

Mr. Neal—I use the West Virginia coal. I have used the Youghiogheny and other coals. With the West Virginia coal I have no trouble. With the use of a trifling percentage of an enriching agent I can, and sometimes do, bring up my candle power to pretty high figures. I like the iron sponge very well; and, as I have already said, I would not be willing to change it for lime. I do not think the presence of the carbonic acid is any serious objection, owing to the large yield and high candle power obtained. The labor, as I have stated, is very small; and, indeed, I fail to see any objection whatever to the use of iron sponge. I do not know how long it will last; I have used the lot last purchased for two months, and I expect it will last a good while longer. Its capacity to purify seems to remain at between four and six thousand cubic feet to the bushel. I can recommend its use even to those who are located near the seaboard where oyster shells are comparatively abundant, and more especially to those who are further inland than our situation in Charlestown, Massachusetts. Even in Massachusetts the oyster shell lime which we formerly used was quite expensive, costing four or five cents a bushel, although I have purchased it at as low a figure as two cents. Provided I could purchase oyster shell lime at two cents per bushel I should still prefer the sponge, at least so long as it continues to give the satisfactory results that we are now obtaining from it.

Mr. Littlehales—During the first eight years of my experience in gas manufacture I used oxide of iron for the removal of sulphuretted hydrogen. I do not think it is desirable to use the oxide if you are not working more than four purifiers. My own experience, and that of a good many others, will scarcely endorse what Mr. Neal has said regarding the unimportance of the presence of carbonic acid. It is generally accepted as an axiom in England that about a candle or a candle and a half of depreciation in illuminating power will follow the method of purification by oxide of iron alone. The usual practice now is to have six purifiers, using the first two for extraction of the carbonic acid. I am now putting up six boxes for the purpose of carrying out that idea. We have used oxides of various kinds—the manufactured oxides, and also the natural product. As a rule we find our experience goes to show that the natural product is cheaper in the long run. We use the material in various thicknesses, sometimes filling the box the entire depth. It can be very easily revivified without removal from the box. I have known cases where the oxide has not been taken out for eighteen months. In Toronto they have a very efficient method of handling the oxide, removing it only about once in three times, the intervening renewals being done with a blower and a jet of steam. If you blow in air alone the high temperature generated by taking up the oxygen and reoxidizing the sponge will overheat the purifying box; but the use of a jet of steam prevents anything of that kind from happening. There are many works in England where purification does not cost anything, because the oxide of iron when too greatly exhausted to act as a purifying agent has become saturated with sulphur to the extent of 45 or 50 per cent.; this saturation making it worth a large price to the manufacturer of sulphuric acid; in fact is worth one-half the price of natural sulphur. The labor item in purification can be reduced to a very small figure through following out the practice of renewal by the aid of a steam jet. I am now putting up six purifiers, 18 by 20, to carry out that idea.

Mr. Neal—I forgot to state one thing in relation to revivification by injecting steam and air. This method was employed by an assistant at my works. He attempted to accomplish that method, but met with a disastrous result. The interior of the box was brought up to a red heat, and the experiment was attended with considerable danger. I shall never again, in any works of which I may have charge, allow any one attempt to secure revivification in that manner. I allowed my assistant latitude in this matter to do as he thought fit, as I had had no experience in that particular method, and further owing to his having successfully pursued the plan in another works with which he had been formerly connected. I did not understand how it was that he made such a failure of it at Charlestown. I will say, further, that I have four purifiers (three in use and one out of use) in which I use nothing but the oxide; I would not use lime. If I were building a new set of purifiers, or contemplated the erection of additional boxes, or had one or two supplementary boxes, I would then use some lime in order to take out any carbonic acid, bi-sulphide, or kindred impurity.

Mr. Harbison—Leaving out of question the necessity for some mode of changing the purification (with regard to cost of material, owing to location, and also the annoyance that the lime nuisance causes to a neighborhood), I would like to ask if any one present can give the result of five years' use of oxide. Could we obtain such a comparative statement we could determine at once the relative money-saving value of the one over the other.

Mr. Coggshall—For the five years previous to 1879 the cost of purification (for material) footed up to $1,279; but then, again, the quantity of gas purified during the five years from '79 was very much greater. I have not got the exact figures with me.

Mr. Harbison—You do not know the cost per thousand feet for purification?

Mr. Coggshall—No; $1,279 was the cost of lime purification for the five years previous to my using the iron sponge; and the cost of iron sponge for five years was about $250. As to the cost of labor, it is fully one-half less with the sponge. I have no doubt that Mr. Neal's trouble with the first lot of iron sponge worked was caused by passing some tar into it. I judge that to be the case, reasoning from my own experience. I wrote Mr. Connelly in relation to the carbonic acid, and in response he suggested I should not use any pure water, and that I ought to have passed more ammonia into the purifiers. I thought that I would do this pretty thoroughly, so I stopped using ammoniacal liquor also. I ran along in that way for about six months. The first effect developed was that tar was passing into the sponge, the result being that I had to throw away about twenty-five bushels of it. As soon as I made the discovery I again commenced using the ammoniacal liquor, and the trouble ceased. There is no tar passing over into the last section of the scrubber. I am satisfied it is very important the tar should be taken out. If sawdust be used in the bottom layer it will take it out; but of course it uses up so much of the capacity of your boxes.

Mr. Harbison—What scrubber do you use?

Mr. Coggshall—It is a scrubber that I devised myself.

Mr. Starr—Can you purify as much gas with the sponge in winter as you do in summer?

Mr. Coggshall—I did up to last winter. In the summer months I have passed a million feet to a purifier. As I said in the paper, with the large amount used in winter as compared with the summer season, I did not get so good results; but at the same time the working was satisfactory. I have been using the same material for five years, and at present I am purifying with it nearly 7,000 feet per bushel. Last December the amount decreased, running down to about 6,000 feet. I supposed then that the material was getting exhausted, so I ordered another quantity; but the last consignment has not yet been put into service. I shall continue to work the original lot until it becomes unprofitable to do so. My mode of revivification (and here comes in an important item in this matter, as thorough revivification greatly increases its capacity) is to take it out of the boxes as soon as a purifier is changed; I then heap it up in a pile about three feet high, and let it stand for forty-eight hours. A laborer then turns it over, and continues the turning over process every morning until the mass is thoroughly cooled. When cooled properly it is ready for work at the next change. Having on hand material enough to make six changes, I can, of course, run it along for a lengthy period. I visited Holyoke, Mass., recently, and was told they had been using the sponge there without any success at all. The only reason that I could see for this was that they could not run it more than twenty-

four hours. They had not enough material to revivify it. It was put back again into the boxes almost as black as it was when it was taken out. Without any relation to the lime nuisance, and as far as the profit is concerned, the cost is about half what the cost of lime would be at my plant. Its advantage, of course, is to be determined by each company for itself, taking into consideration the relative cost of sponge and lime.

Mr. Boardman—I will answer the question of Mr. Harbison in respect to the cost of purification by lime in my case. I gave $1.10 per barrel for stone lime, unslaked; and I find that the cost of purifying by lime for the three months and a quarter just preceding the introduction of the sponge was greater than the cost of purification for the next twelve months, when using the sponge. I tried the experiment of revivifying in the boxes, and came very near losing a set of wooden screens. I do not want to try it again. I put in an inch pipe, and tried a half-inch jet of steam, which I thought was ample; although the bottom screen was not affected very much, the middle screen was almost entirely consumed before I discovered the condition of affairs. This experience cured me of all desire to repeat the trial.

Mr. Starr—I have been using iron sponge for about two years. When making alterations in the works some time ago I put in larger purifiers, and ordered quite a lot of sponge—about 800 bushels. I have now been working with that, as stated, for some two years. I have purified over 50,000,000 feet of gas with it. I use it in such a way as to have the benefit of the lime at the same time. I place on my lower screen a 4-inch layer of lime, and then cover it with burlap. That saves all the sponge. Then I put on two more layers of sponge, each layer about 10 inches in depth. The burlap saves it from falling through on to the lime; and the lime takes up almost all of the tar that would pass through. I take out the carbonic acid at the same time that I am purifying from sulphur. I find it to work very satisfactorily. In the winter I purify 5,000 feet per bushel, and 6,000 in the summer. That is the difference between my winter and summer experience. I make the lower layer one of lime.

Mr. McMillin—With the exception of about three months, last fall, I have not used any lime for sixteen years. I have used sponge with two boxes, with three, with four, and with eight. I have used it in works making three million cubic feet per year, and in works making 140 millions. I would not use lime if one would give it to me. In one of the works where I first employed the sponge I have been using the same material over and over. So far as I know, we never throw any away. It shrinks a little through handling, and a portion of it may wash away; but the same material has been in use for ten years. It has been burned over half a dozen times. We spread shavings on the ground, throw the sponge on them, start them burning, and the desired end is accomplished. Before trying this primitive method of revivification we had a similar experience to that recounted by Mr. Boardman. Sometimes, though, through our plan of burning it we obtain an oxide which is not just the quality desired. I am inclined to the view that you do not get nearly as satisfactory results from reburning the sponge in retorts as when reburning it out of doors. In the largest works that I am connected with we are now using the sponge. We used lime there during three months of last fall (we first took possession of them then), because we were waiting for the completion of a new purifying house, and we did not propose to change from the lime system until this was done; therefore the purification was continued as it had been practiced by the former owners. We were employing four men to handle the lime material—to put it into and take it out of the boxes; also one team and a man to haul the spent lime away. It had to be carted to a distance of a mile and a half. In the winter time we were obliged to put on two extra men. The entire cost ran from $15 to $25 per diem. We began the use of oxide there during the first week of last December; and it only costs us now from 25 to 50 cents per day. We now have one man in the purifying house but two days in three weeks. From these statements you can easily see the difference, in our case, between the cost of using lime and oxide of iron. The boxes are 20 by 24. When partly foul, the box lid is removed, and the mass is allowed to remain untouched for 24 hours. At the end of that time a laborer, scoop in hand, enters the box, going right around the sides, and throws out a small quantity on the floor—just enough to enable him to start the operation of turning over the mass in the box. He commences at one end and turns the whole mass right over; it takes him pretty nearly all of one day to do this. The next day he turns it back the other way; and so, without any jet of steam, or any air being forced through, it can be gotten all ready and in shape to have the lid replaced. But the lid is not put on yet; the box may stand there uncovered one or two weeks before being adjusted. This plan, then, occupies one man two days, instead of five or six men every day, and wastes almost nothing of the material. You could not get me to use lime at all.

Mr. Harbison—How often do you have to turn over the sponge when performing the operation mentioned?

Mr. McMillin—I think that twice will be ample, if your boxes are large enough. If you want to use the box right off you would probably have to turn the material oftener; and the oftener you turn it the more rapidly will it exhaust. At this time of year we change about every two weeks; and after we change we usually allow a week or ten days to elapse before we close the box. We allow the material to become quite clean, as it costs nothing to do it.

Mr. Starr—Do you do that month after month?

Mr. McMillin—Month after month; and about once in three months we throw it all out, so as to clean the trays. So far the passage of the gas through the material does not appear to have hurt it at all. After a while it may become so fouled that it will not purify the gas; but thus far it has done its work perfectly. The boxes we use are 3 feet deep, and the lower tray is 4 inches from the bottom. The three boxes, after they have been running for three weeks, will give about a quarter of an inch back pressure to each, or three-quarters of an inch to the whole. We use the sponge perhaps under more advantageous circumstances than most men do. We have four boxes, 16 feet square.

Mr. G. S. Page—There are three points in this discussion which are of peculiar interest. First, economy in the use of the oxide; second, the improvement in the purification of the gas; and third, the value of the product or residuum. At present, in this country, the exhausted sponge possesses no value. I had occasion, some three years ago, in connection with two gentlemen from Manchester, England, to look into this matter. They wanted to purchase this oxide, containing from 50 to 60 per cent. of absolute sulphur. As we went from pile to pile, in our investigation, we discovered heaped up in the vicinity of various gas works at least 600 tons of sulphur contained in the waste oxide. It has been accumulating in all parts of the country; but I cannot discover that it has been as yet made a source of profit to our American gas makers. The receipts for this residual on the other side are in the neighborhood of a total of £100,000 per annum. The question becomes important, in view of this fact, how the sulphur in the spent oxide can be made available here. It could be done in the usual way, by burning the sulphur and making sulphuric acid. The process, as I have witnessed it in England, is something like this: The oxide is fed into an oven on an inclined plane, and spread therein to a depth of about 2 inches. A rake is then moved automatically to and fro, and you can plainly see the flames of sulphur burning off. The fumes are conveyed from there to the sulphuric acid chamber. Inquiries are now being made by the manufacturers of sulphuric acid concerning this mode of obtaining sulphur—not at $28 or $30 per ton (which is the price of brimstone), but for from $2.50 to $8.50, which is about the price in England for the oxide containing 50 per cent. of sulphur. I have no doubt, if this spent oxide sponge you are now using were put to one side, it would retain the sulphur, and be just as valuable a thousand years from now as it is to-day; and by and by it may come in and help to pay the dividends.

Mr. F. C. Sherman—As I understand it, many members have abandoned the use of lime, even when they prefer it, and are using the iron solely because they wish to avoid the spent lime nuisance.

The Association then adjourned, to reassemble at 10 o'clock on the following morning.

[To be continued.]

Combustion of Explosive Gas Mixtures.

The *Scientific American* says that experiments in regard to the flashing temperature of explosive gases, and the velocity with which the flame is transmitted, have been made by Mallard and Le Chatelier.

1. The flashing temperature of explosive gases composed of hydrogen and oxygen being at 550° C., carbonic oxide and oxygen at 655° C., and that of marsh gas and oxygen at 650° C., on adding of a large volume of indifferent gases to a volume of marsh gas and oxygen, the flashing point becomes but slightly altered, while addition of an equal volume of carbonic acid to a mixture of carbonic oxide and oxygen raises the flashing temperature from 655° to 700° C. Marsh gas and air or oxygen intermixed with a neutral gas can be heated for ten seconds at a temperature above the flashing point; the retardation of the ignition increases with the amount of indifferent gas added, and is a maximum at temperatures little above the flashing point.

2. The velocity with which the flame is transmitted depends upon various conditions; the ignition is either conducted from one stratum to one above and below, transmission by contact, or is propagated by means of high pressure, transmission by an explosive wave.

This latter conduction of the flame has been investigated by Berthelot and Nieille. The two transmissions correspond to the combustion and explosion of liquid and solid explosives like nitro glycerine and dynamite. Intermediate between both are numerous other modes of transmitting the flame, which depend on accessory conditions and unknown influences. The velocity of transmission by contact probably never exceeds 20 m. per second, which has been verified by numerous experiments. The maximal conducting power of a mixture composed of 40 per cent. of hydrogen and oxygen, the equivalent quantity of hydrogen being 30 per cent., is equal to 4.3 m per second, a mix-

ture of marsh gas and air transmits the flame with a velocity of 0.6 m., illuminating gas and air with such of 1.25 m., and the gaseous explosive of carbonic oxide and oxygen with a velocity of 2 m. per second. The quantity of oxygen employed in these measurements has been less than its chemical equivalent, and the product of combustion was thus intermixed with a portion of the inflammable gas. The conducting power increases with the initial temperature, and depends upon the width of the tube; by using narrow tubes in the examination of explosive gases with great conducting power, the transmission of the flame is accompanied by irregular oscillations, and, when these oscillations follow each other very rapidly, cause diminution, and finally extinction of the flame. It is at first communicated with uniform velocity, and assumes, after some time, which depends upon the conductive power of the explosive gases, a vibratory motion, the report of the flame becomes louder before and after each vibratory period, and, traversing gases of high conducting power, is extinguished before it has reached the final vibratory period.

When the transmitted pressure caused by vibratory motion and extension of the burned gas is equal to that produced by heating the explosive gases to the flashing temperature, the combustion is propagated with a velocity of the compressed wave, we have then a transmission of a flame by an explosive wave.

SPECIAL ENGLISH CORRESPONDENCE.

Communicated By Norton H. Humphrys.

Salisbury, Nov. 10, 1884.

A serious explosion of gas occurred in one of the poorer districts of London at about half-past nine on the evening of the 16th ult. The houses in the district in question are of the sort known here as four-roomed cottages, intended for the occupation of a laboring man and his family, and consist of front room, back room, and two bedrooms above; but such is the cost of rent, two or three families frequently inhabit one of these tenements, and the house to which we have to refer was occupied by three separate couples, of whom two were without family, but the third had three children. No. 28 Edward street, Star Corner, Bermondsey—for such is its postal address—thus affords some idea (and unfortunately rather a favorable one) of the miserable social conditions under which the majority of our London poor are obliged to live. A strong smell of gas having been perceived, complaint was sent to the gas offices, and a gasfitter and laborer promptly arrived on the scene. After investigating in the road and footway without success, they proceeded to examine the front room of the house, and were taking up a floor board by the light of a candle close by, when the explosion occurred and literally brought the house down about their ears. The front and back walls were blown outward, and the roof, flooring, and partition walls fell in, burying two of the couples, the three children above mentioned, and the gasfitter in the debris. The whole house, with its contents, was completely wrecked; and it is remarkable that any of the unfortunate inmates escaped with their lives. As it is, the casualty list includes the death of a child four years of age, five cases of serious injury (which are all progressing favorably), and some seven or eight more or less severe cases of cutting and bruising. The adjoining houses on each side were also much damaged, and some slight injuries—such as breaking of windows—occurred to those immediately opposite on the other side of the somewhat narrow road.

The conditions which led to the catastrophe were outside the range of the gas company's operations, and were caused by circumstances that, to say the least, are frequently the cause of serious loss by leakage. The gas main in Edward street was small—being only three inches in diameter—and the gas was not used in No. 28, or in either of the adjoining houses in the row. Subsequently to the laying of this main a new sewer was carried through the street by the Metropolitan Board of Works, and was laid at a considerable depth—far below the gas pipes, which were unearthed during the progress of the sewer. In some cases, to keep the gas pipes in place, it was necessary to support them by upright struts resting on the top of the sewer. The road being narrow and the excavation deep, it was found necessary to shore up the houses by means of large beams placed horizontally across the road from one house to the other. In the first place these horizontal timbers were laid some inches above the gas main. According to the evidence of the gas company's engineer, Mr. Frank Livesey, the gas main was found to have been completely broken across. It was supported near the point of fracture by an upright strut, and near to it were two of the horizontal beams, which were laid all along the street at intervals of five feet. One of these had settled down on to the top of the gas main, and, meeting the resistance afforded by the upright strut, had thus caused the fracture. From this fracture the gas found its way through an unused drain into the foundations of the ill-fated No. 28. At the inquest the jury returned a verdict of "accidental death," but added an opinion that there had been neglect on the part of the gas company in not seeing their main properly secured before the completion of the roadway above the sewer.

This shifting of the blame upon the gas company is certainly rather hard lines. Evidence was produced to show that the matter was not neglected by them, and that frequent representations were made to the contractors, from the gas company's office, during the progress of the sewer. The company were desirous of having an inspector present when the ground was filled up, but did not have an opportunity of doing so. It is possible that the verdict, coming from a jury composed of residents in that locality, was accompanied with this expression of opinion in order to give some sort of hold on the gas company for damages.

This accident brings forward a state of things which oppresses many gas companies. If only they can secure their mains from disturbance, and especially from underpinning on removal of the soil from beneath them, it is easy to secure an absolutely tight system of mains. But if a trench is cut, say, 12 feet or more deeper than the gas main, and along the same line, long lengths of main are left with no better support from beneath than the freshly filled-in ground, with the exception of an occasional upright strut, which is a source of danger rather than otherwise. But for the upright strut in the accident just described it is possible that the line of piping might have sagged down with no worse result than the dragging of a few joints, and a loss of gas by slight but long continued leakage. But gas companies are very much cramped as regards their rights in these matters. Any representations they make are usually treated with indifference by the contractors for the sewers, who wish to push on and finish the work as soon, and at as little expense, as possible, and are not inclined to incur extra trouble or cost for securing the gas pipes. Nor are the local authorities, as a rule, willing to afford much help. Accidents occur so very rarely that they lose sight of the fact that in the interest of the public safety gas mains should be well supported from beneath; they regard it merely as a matter affecting the revenues of the companies. Even if the gas companies are willing to attend to their mains at their own cost, it is possible that the contractor may demur, fearing some interference or hindrance with his own operations. The laying of new sewers in a town is indeed the cause of much anxiety and trouble to the gas engineer, and also of a very remote but no less real danger to the public health and safety. In the absence of solid support from beneath, the amount of strain that is thrown upon a line of gas mains, when the traffic is heavy or frequent, is very considerable; and the placing of upright struts at long intervals is likely to be worse than useless. A firm, solid support, all along, must be provided.

As indicative of the closing of a chapter in the history of the London gas supply, and in connection with the new arrangements made by the Gas Light and Coke Company, as mentioned in my September letter, I may refer to two interesting gatherings that were held at the St. Pancras and Haggerston stations, respectively, on the 20th ult. The chapter that is now closed is the independent management of the various gas works which, owing to repeated amalgamations, have become the property of the Gas Light and Coke Company; hitherto they have been managed by separate superintending engineers, but now they are to be merged under one head in this respect, and will in future be managed by resident engineers under the supervision of the newly-appointed "constructing and carbonizing engineer in chief." And the two gatherings were those of the employees and workmen, for the purpose of presenting addresses and testimonials, on the occasion of the retirement of Mr. John Clark from the management of the St. Pancras station, and Mr. Henry Clark from the management of the Haggerston station, in accordance with these alterations. The warmth of the sentiments expressed in the addresses, and the value of the testimonials (a silver inkstand and a silver epergne, respectively), are only as much as would be expected by those at all conversant with London gas matters; both gentlemen having been connected with their respective works for the best part of their lifetime, and held the position just resigned for nearly a quarter of a century. Messrs. John and Henry Clark retire with the respect and good wishes of all who have been officially associated with them, and will long be remembered as gas engineers who met and successfully combated with difficulties that happily no longer harass the gas works manager, and in a great measure smoothed the way for those who follow.

So far as may be judged by the official list of patents, inventors are very busy in various departments connected with the gas industry. The number of specifications that have been lodged in connection with gas engines within the last few years (and the number deposited weekly is rather on the increase than otherwise) is remarkable, particularly as the various kinds that are prominently placed before the public could be counted on the fingers of one hand. Examining the mechanism and design of a gas engine which is not much more complicated or numerous in detail than that of a steam engine, it is difficult to see where there can be room for so many modifications, and how the numerous inventors can avoid inventing the same thing over and over again. Nearly one hundred applications for patents in connection with the gas engine were lodged during the first half of this year, and, so far as can be judged, the number lodged during the second half will not fall far short. The various kinds of gaseous furnaces have also received a fair amount

of attention, and several modifications, especially as regards the regenerating department, have received legal protection. Next to these, gas stoves, both for cooking and heating, and gas burners, especially those of a large description, and including recuperating or ventilating arrangements, have been introduced. Looking at the number of patented inventions, and comparing the same with the new appliances or methods that really acquire an established demand in connection with our industry, it is evident that a very large proportion do not recoup the legal expenses incurred, to say nothing of earning any remuneration for the time and trouble which the inventor has bestowed upon them. As regards the gas industry, however, this activity among inventors cannot be accepted as other than a satisfactory sign; though scarcely to be taken as actual evidence of its progress and prosperity, it must be in some way connected with the continued increase in the demand for gas.

On the whole, the markets are favorable to gas undertakings, although sulphate of ammonia shows no signs of improvement, and there is some fall in the price of tar. As regards the former, it is not likely that the rates of £19 or £20 per ton that have been attained in the past will again be reached, or even approached, in the future. Iron has been cheap in price, and on account of the continued run of mild weather, coal can be obtained at some reduction on last year's prices. Of course there is the detraction that cheap coal also means cheap coke. The weather during the month of October has been extraordinarily fine and mild, and consequently, as a general rule, the sales of coke have fallen off and are below the average of previous years, leaving a large stock on hand. Coal and iron may be regarded as the staple materials for gas works, and, provided these can be obtained at favorable rates, there is no difficulty in keeping things going.

Prof. Wanklyn is still working hard as the exponent of the "Cooper Coal Liming Process." At a recent meeting of the Society of Engineers he contributed a paper on that subject, describing the different conditions prevailing in the methods of purifying gas produced in the ordinary manner, as compared with the purification of gas from limed coal. On the authority of Prof. Vernon Harcourt it is said that the Cooper process retains five-sixths of the total quantity of sulphur present, leaving only one-sixth to be removed in the oxide purifier. Having only this small quantity of sulphur to deal with, it is claimed that by admitting a small proportion of air (too small to prejudicially affect the illuminating value of the gas), the oxide can be continuously revivified, and therefore may continue in use without being disturbed until the sulphur accumulates to such an extent as to cause excessive back pressure. The principal feature of the discussion that followed the paper just mentioned was a long speech from Mr. R. P. Spice, giving details of his experience in working the process on a practical scale at Tunbridge Wells gas works. As regards the saving in purification, I am in a position—thanks to the courtesy of Mr. Spice—to give your readers some information. A purifier 20 feet square and 5 feet 6 inches deep has purified 101,627,000 cubic feet of gas at one running, and was only turned off on account of back pressure To secure this result one per cent. of air was mixed with the gas previous to entering the purifier. Analysis of the spent material shows that the upper layer of oxide contained 30 per cent. and the lower 50 per cent. of sulphur, giving an average of 40 per cent. of sulphur taken up at one running. This result is worth consideration, especially in localities where the offensive odors which rise when the purifiers are opened are likely to cause nuisance. There is only one opening of the purifier for each 100,000,000 cubic feet of gas made; whereas, under ordinary circumstances, something like twenty openings, with the attendant expense of removing and replacing the material, would have been necessary. I may add that the gas at Tunbridge Wells was maintained throughout the above working in a satisfactory condition as regards illuminating power and purity.

Rapid Determination of Fixed Ammonia.

Mr. J. W. Pratt, F.C.S.,, communicates to *Chemical News* the following paper on the above-named subject:

When free and combined ammonia exist together in the same solution the former is usually estimated by direct titration, and the latter by distillation with caustic alkali and absorption in acid (also of known strength). The difference between the first and the latter result is set down as fixed or non-volatile ammonia, as distinguished from the carbonates, sulphides, etc., of ammonia which neutralize acid and are volatilized on boiling.

The process of distillation for the determination of the fixed or total ammonia is often very troublesome, owing to the frothing caused by the action of the alkali on the organic matter present; and it frequently requires a large amount of time and attention for its successful accomplishment. For this and other reasons, where a large number of determinations of free and fixed ammonia have to be performed daily, the distillation process becomes specially inapplicable. Being placed in such a position, some shorter method became necessary, and the volumetric method of boiling the ammoniacal liquid with a definite volume of alkaline solution, and titrating the residual alkali, naturally suggested itself. This method, which I have used for some considerable time, gives results closely agreeing, and often identical, with those obtained by distillation, but with a much smaller expenditure of time and attention. It is well suited for the testing of gas water and bone liquor, which are nearly constant in constitution, if not in percentage composition. The alkaline solution used for the boiling off of the total ammonia is a decinormal one of carbonate of soda. Sodic carbonate I find more suitable than the hydrate (which has been recommended), as caustic soda is apt to form with the ammonic sulphide sometimes present, sodic sulphide, which gets oxidized to sulphate, and so yields a slightly too high result.

The following examples (out of many) will serve to show how the method is carried out, and agrees with the distillation process:

(1) 5 c.c. bone liquor distilled with caustic soda into 50 c.c. normal hydrochloric acid solution neutralized 25.5 c.c.

$$25.5 \times 20 \times 0.017 = 8.67 \text{ per cent total ammonia.}$$

5 c.c. same liquor titrated with normal hydrochloric acid and methyl-orange indicator = 25 c.c. normal acid.

$$25 \times 20 \times 0.017 = 8.5 \text{ per cent. free ammonia.}$$

25 c.c. of liquor boiled and evaporated to dryness with 25 c.c. N/10th Na_2CO_3, ignited to get rid of organic matter, and treated with water. The solution took up 3.2 c.c. normal hydrochloric acid for neutralization = 16 c.c. N/10th Na_2CO_3.

$$25 \text{ c.c.} - 16 \text{ c.c.} = 9 \text{ c.c. N/10th } Na_2CO_3 \text{ consumed.}$$
$$9 \times 4 \times 0.0034 = 0.1224 \text{ per cent. fixed ammonia.}$$

Adding to this amount of ammonia the amount found by direct titration (8.5 per cent.), we have 8.6224 per cent., as against 8.67 per cent. ammonia obtained by distillation.

(2) 50 c.c. gas water distilled with caustic soda solution neutralized 39.2 c.c. normal hydrochloric acid.

$$39.2 \times 2 \times 0.017 = 1.3328 \text{ per cent. total ammonia.}$$

50 c.c. same sample titrated directly with normal hydrochloric acid = 32.1 c.c. hydrochloric acid.

$$32.1 \times 2 \times 0.017 = 1.0914 \text{ per cent. free ammonia.}$$

25 c.c. evaporated to dryness with 25 c.c. N/10th Na_2CO_3 taken up with water and titrated required 1.5 c.c normal hydrochloric acid = 7.5 c.c. N/10th Na_2CO_3 solution.

$$25 \text{ c.c.} - 7.5 \text{ c.c.} = 17.5 \text{ c.c. N/10th } Na_2CO_3 \text{ consumed.}$$
$$17.5 \times 4 \times 0.0034 = 0.2380 \text{ fixed ammonia.}$$

Adding to the amount of free ammonia (1.0914 per cent.) the fixed ammonia as above (0.2380 per cent. ammonia), we have 1.3294 per cent. total ammonia, as compared with 1.3328 per cent. total ammonia by distillation.

It is well, before applying this method, to test the reaction of the sample to litmus paper before and after boiling a small portion of it. If the liquor remains alkaline after the expulsion of the ammonia by boiling, it is obvious that the method is not suitable without such correction or modification as may be left to the discrimination of the analyst.

Use of Portland Cement in Gas and Water Works.

At the late half-yearly meeting of the North of England Gas Managers' Association, Mr. J. Whyte, of Seaham Harbor, read the following paper:

In bringing before you on this occasion the following remarks on some of the uses of Portland cement in gas and water works, I do so with some feeling of diffidence, as the matter itself seems at first sight to be of so trivial a character. My only excuse is that in the present day, and with the increasing daily cry everywhere for cheap gas, anything and everything that tends to save a shilling, either in material or labor, in the various works under our control deserves our consideration.

I have no doubt that every one of us has, at some time or other, had different kinds of joints to make for water or steam pipes, or both; and we are all quite familiar with the good old-fashioned rust joint so commonly used for such purposes. Having had some such joints to make in a 3-inch steam pipe, and one of them (a faucet joint) under considerable difficulty from its position and want of room, I felt inclined to try an experiment by making it of Portland cement. But, being afraid to trust it alone, I mixed about 9 parts of cement to 1 part of fine iron borings, made up with water in the usual manner, only in a very thin condition; and, forming a belt of clay around the pipe (the same as if for a lead joint), we poured in the cement, trying to make as sound a joint as possible. Next day the thing looked well; but, of course, the tightness of it was the test. Almost "hoping against hope," we, on the third day, opened the steam valve, and found that, with steam pressed to 50 pounds, my fears were groundless, as the

joint was perfectly tight, and has remained so for the ten years during which it has now been at work.

Finding this joint so satisfactory, and having to erect a small water-tank 9 ft. by 6 ft. by 6 ft. deep, and formed with three plates 6 ft. by 3 ft. for the bottom and the sides, and two plates 6 ft. by 3 ft. for the ends, I determined to try the jointing of it with pure Portland cement; and accordingly put it all together as if for rust joints, only we did not put in any lapping-round bolt-necks—the joints being about 5-16ths inches wide, and all inside the tank. After this we simply rubbed a piece of clay on the outside, while the inside had a roll of clay set up against it to make the face of the joint nice and full. We only did it half the depth at one time, in order, if possible, to insure a sound joint; and, having made a good large dish or gateway of clay on the top, we poured in the cement, in a nice fluid state, and left it for some hours, then repeated the operation for the top half. After two days we found it as tight in every part as if it was one solid casting.

I was so pleased with the result of this experiment, and the importance of the matter (which seems so trivial), that I determined then to test, if possible, the pressure a pipe joint thus made would stand. For this purpose I had two pipes joined together with one strand of yarn, the joint being filled with the cement, which, after 13 days, I found to stand 1,000 pounds pressure without any sign of leakage. I could not test at a higher pressure. From what I have seen of it, I have no hesitation in saying that even cast iron gasholder tanks can be thus made, and be perfectly tight; and this at a considerable saving, as it does not require any skilled labor, but simple care on the part of any ordinarily intelligent workman.

I hope you will excuse my bringing so small a matter as this before you; but if any of the members derive benefit from my so doing, I shall feel that your time has not been taken up in vain.

In the ensuing discussion Mr. Tobey inquired if the joint referred to by Mr. Whyte was subjected to variable degrees of temperature, and whether it was air or water pressure. If water, he asked whether it was hot or cold.

Mr. V. Wyatt found that where iron columns were jointed with cement they contracted with cold; and as the cement had no elasticity in it it cracked at once. Everyone knew that substances, particularly iron, expanded and contracted under the influence of heat and cold respectively; and unless they could get a joint with some elasticity in it they could not expect it to hold together in all seasons. As an instance of extreme want of elasticity in cement, the members would all be aware of a practice in vogue of covering a crack in a wall with a thin film of cement; the object being to ascertain whether the rupture was continuing to open. If it was so, as soon as the cement dried it was found to be cracked, even although the extent of the further opening was otherwise imperceptible.

Mr. J. Hepworth inquired if a difference in the quality of cement would not have a varying effect on the strength of the joints. It would, he said, be as well to know whether the right article had been used in the instances which had proved failures. He thought the different qualities would give different results.

Mr. J. Watson thought the quality of the cement made all the difference. In the firm with which he was connected they had frequently made joints with Portland cement, and they had always proved satisfactory. The pipes would, in every instance, have to be broken before the cement joints would give. They had not used iron borings, not seeing any advantage in so doing. The water in the pipes was on Sundays cold, and on Mondays heated to 120° F. The pipes had been tested up to 50 or 60 pounds pressure.

Mr. Wright asserted he had used Portland cement for joints, as described in the paper, and did not think that under these conditions it would be so subject to contraction and cracking as to cause disaster to the joints.

Mr. Whyte, replying, said hot water was put into the pipes and shut off frequently, and the cement had not cracked. He had not used any oil with the cement, and had simply introduced the iron borings with it because at the time he was making the experiment he was afraid, if he did not do so, the joint would not hold. However, if he had occasion to make a similar joint he would not use borings.

Artificial Ball Lightning.

M. Planté lately caused to be published an account of some experiments made by him in the attempt to solve the cause, and also to furnish an explanation, of the phenomenon of "ball lightning." The experimenter had his mind directed to this channel through having one of his mica condensers destroyed by a similar phenomenon. He charged one of his condensers from his secondary battery of 800 pairs, when the condenser was pierced, and instead of a bright spark a small incandescent globule was formed, which moved slowly over the surface of the condenser, following the parts where the insulating layer had least resistance, and destroying the metal film, the path being most curious and erratic. This motion continued, and the globule lasted one or two minutes until the batteries ran down. In the case of a condenser in which the insulating material was ebonite, a sound was emitted similar to a toothed wheel being rapidly rotated against a piece of cardboard or sheet metal; at the same time there was a strong smell similar to that produced when ebonite is burnt. M. Planté repeated this experiment with 1,600 secondary cells, which gave an electromotive force of 46,000 volts, and obtained a similar but much more complicated result. The second experiment made was to make a condenser of two flat pads of filter paper moistened with distilled water and brought near together, so as to form an air condenser; now, on connecting this condenser with his battery he obtained an incandescent globule which moved about between the pads and passed from one to the other. In this case he noticed that if the pads became dry at any point the globule disappeared, but either appeared at some other point or at the same point again as soon as it again became damp. In this experiment he found that the globule lasted a much greater time than in the case of the mica condenser, which fact was owing to the greater resistance in the condenser plates, which did not allow the battery to discharge so rapidly.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

The Braddock (Pa.) Gas Light Company.—The location formerly known as Braddock's Fields, a township situated at a point on the right bank of the Monongahela River, in Allegheny County, Pa., about ten miles from Pittsburgh, has long been known in the history of the country as the place where, on date of July 9th, 1755, a body of English troops, under command of General Braddock, were defeated by the allied French and Indian forces. For many years the old town plodded sleepily along in quiet humdrum fashion, until the time had arrived when the whole business pulse of Allegheny County was quickened into active life and being with the uncovering of its hidden wealth of coal and iron. Braddock's Fields participated in the business revolution, and emerging from its lethargic state, rechristened itself Braddock, and entered upon a new career. The gradual accession of wealth and members led to the inevitable result that kerosene oil was considered by many of its denizens as a method susceptible of being improved upon as a means of illumination, and so it was determined that a gas company should be formed. This determination once reached the work was set about in earnest, and now the Braddock Gas Light Company makes its bow to the fraternity. Gas was turned on to the mains on the evening of November 1st, and the event was made the occasion of general rejoicing. Mr. H. H. Highlands, Superintendent of the company, writes us, under date of November 17th, that, having only one bench of sixes, he can barely supply the demand made upon the works. A sliding scale of prices has been instituted, varying from $1.50 per thousand, to the largest users, to $1.80 per thousand for the smallest monthly consumption. From the foregoing it will readily be seen that there was plenty of room for a gas company in the town of Braddock. "May its shadow never grow less."

Reducing Price of Gas at Grand Rapids Michigan.—Mr. Thomas D. Gilbert, Secretary of the Grand Rapids (Mich.) Gas Light Company, writes us that another step in advance has been taken by the management, and the forward step consists in "casting an anchor to windward" in the shape of lowering the selling rates. On the first of October, 1883, the Grand Rapids consumer received the benefit of an important reduction in the charge made for gas consumption, and the result has also been so satisfactory to the gas company as to induce on its part a repetition of the former experiment. The official circular recently published gives notice that on and after first day of January, 1885, the following schedule will go into effect: All monthly consumption (as shown by the registration of one meter) reaching to an aggregate of 5,000 cubic feet, to be charged for at the rate of $1.50 per thousand, net. A monthly consumption of from 1,000 to 5,000 cubic feet, $1.60, net; a monthly consumption of less tham 1,000 supplied at the net figure of $2.00 per thousand. All gas supplied to gas engines will be charged for at the lowest net price in schedule. These figures are not to apply except in cases where bills are paid at the office of company on or before the 15th day of month. The new rates are extremely reasonable ones, and we incline to the view that the experiment will meet with as great and even a greater amount of success than its predecessor of 1883.

Street Lighting Matters at New Orleans, La.—Our Item columns of issue of November 3d contained some reference to propositions emanating from the Brush Electric Light Company, the managers of which concern appear to be desirous of doing a much larger portion of the street lighting of New Orleans than they at present are attending to. We also noted at that date that the city Council usually referred such matters to a "select committee of one," in the person of Alderman Lehman, for examination and report. The tower scheme then proposed may or may have not gone through at that particular time; as to its accomplishment or rejection we have not been advised. From a late statement just to hand it would appear as though

the tower arrangement was not successfully prosecuted, since it was proposed to locate it at the corner of Barronne and Delord streets, and the most recent information goes to show that the Brush Company, at the meeting of Council held on November 11th, submitted a proposition offering to enter into a contract binding themselves to furnish 28 electric lights of 2,000 candle power each; the lights to be placed at street intersections, one to each corner, and to be distributed at points between Delord street and Louisiana avenue. The lamps are to burn all night and every night for a period of 13 months, commencing with December 1st, 1884, and terminating Dec. 31st, 1885, at a total cost to city of $5,600, or $200 each per annum—the stated price to be paid in monthly instalments. Mr. Charles F. Black, the President of the Brush Company, made the above proposition to the aldermen; and, of course, Mr. Black is of the opinion the city should lose no time in entering into the contract, claiming that the corporation could dispense with 200 or more gas lamps during a period of 13 months, the cost of the displaced gas lamps being somewhere in the neighborhood of $4,000. He then goes on to say that the tax on the company's poles would reduce the cost of electricity by so much more; and, on the whole, figures it out that the proposed electric lighting scheme would, dollar for dollar, be equally as cheap as the gas service. The electricians are great figurers, but their performances somehow or another never tally with their pretensions, no matter whether they are operating in New York or New Orleans, or at any of the points intervening between the long distance of territory separating them. Our despatch fails to note whether or not this proposition was submitted to the tender consideration and critical regard of Alderman Lehman's select and exclusive "committee of one," but suppose the information will come along in due time.

While on the subject of New Orleans it might be well here to consider the fact that great complaint appears to exist amongst the gas consumers of that city with reference to the poor quality of the illuminant supplied them. A late issuse of the New Orleans *Times-Democrat* had a goodly portion of its columns recently taken up in describing the discontent that existed amongst all classes of such consumers. Those in charge of the gas apparatus at the theaters were especially loud in their complaints, and it was asserted by them that the new article of water gas now supplied was wretched in the extreme. The manager of the Southern Express Company's office said the light afforded was dim and unsatisfactory; and the irate gentleman further added, alluding to the gas jets used for melting the sealing wax applied to the securing of letters and small packages, resembled the pitch pine torches employed by parties engaged in spearing for flounders more than a gas light. The janitor of the new Cotton Exchange building said that he had never before seen gas of such bad quality. The proprietor of the St. Charles Hotel said that he had to expend $250 in cleaning his ceilings from the soot which had collected on them through the smoky and imperfect combustion of the illuminant. He also added that the bills had not been diminished in the least. There must be some good ground for the complaints, coming as they do from perfectly responsible sources; and further corroborative evidence is furnished New Yorkers who read the following paragraph in the New York Daily *Tribune's* special New Orleans correspondence, of date of November 23d: "The water gas process which was some months ago substituted for the old coal gas system, and from which so much was expected in the way of increased light and reduced bills, has proven a failure, and complaints by the public are many and loud. Lamps, and in many cases candles even, are preferred to it." This is a rather bad condition of things; but the men who own and control the wonderful water gas systems and patents have made the same sort of promises put forward in such profusion by the electric gentry, and their performances may be set down as closely allied. If Alderman Lehman's exclusive committee is to be checkmated, and the schemes of the electric lighting promoters rendered nugatory, it would seem as though the New Orleans Gas Company might find it advantageous to institute some sort of reform in manufacturing methods.

No Excuse if You do not Receive a Copy.—The handsome and useful annual edition of the "Gas Engineers' Pocket Diary and Almanac," gotten up by the American Meter Company for free distribution among the fraternity, will soon be sent through the mails. Some complaint has been made in the past that in occasional instances the welcome visitor has failed to put in an appearance. In order that such a failure may meet with remedy, all those who do not receive a copy by date of January first, 1885, should notify the American Meter Company, No. 512 West 22d street, New York city, to that effect.

Being Tortured by the Electric Light.—There is no doubt but the electric lighting street service of New York city is expensive as to cost, and wretched as to service; and yet we are confronted with the fact that the system is extended every year. The only at all reasonable application of the "moons" has been made along the water front where they have been rather thickly placed. The attention of the city press has recently been turned to the subject, and as a sample of how the "formers of public opinion" are disposed to regard the "light of the future," we quote the following from the New York *Sun*: "The city is being tortured with electricity. The blinding, hissing carbon points that were at first peculiar to the Bowery, and rendered that thoroughfare unpleasant at night, have been taking the place of gas in one street after another until most all of the main thoroughfares are furnished with them. They are poor substitutes for gas light. They blind at short range, and at a distance emphasize the darkness. Indoors we are provided with domesticated electricity that is neither better nor worse than gas, but the pyrotechnic beacons of our streets are very unpleasant to the eye, and are no improvement on gas." That is plain enough.

Mr. J. H. Rollins, of Worcester, Mass., Distinguishes Himself.—The evening of November 18th was rather an exciting one at the works of the Worcester (Mass.) Gas Light Company, and how the particular date so greatly differed from the general working order of things appears to have been brought about as fellows: When Superintendent Rollins left the works everything seemed to be in perfect order, and the operation of distribution was going along smoothly. But an alarming state of affairs speedily manifested itself. The valve-house, a low, substantially-built brick building, illuminated by a single gas jet, was discovered by the office boy (a lad named Reynolds) to be on fire. From some unexplained accident a fracture occurred in one of the retort-house conduits, and the volume of the escaping gas was so great that it ignited, without explosion, from the burning jet lighting the house. Young Reynolds attempted to shut off the valve leading to holder inlet, but being severely burned in the effort, gave up the trial. He then sounded an alarm of fire, in response to which the Fire Department apparatus speedily arrived, as also did Superintendent Rollins. A slight thing like "fighting with fire" did not frighten or deter him from at once jumping through the blaze and shutting off the valve connections with the holders. There are two of these, both together of a capacity of 570,000 cubic feet. Mr. Rollins received rather severe personal injuries, but is now on the high road to recovery. The only inconvenience to the citizens ensued from a temporary shutting off of the supply to the southern part of the city. Might we call upon the "plucky" and genial Mr. Rollins to furnish us with the particulars of the affair—the causes leading to the leak, etc.

Something from Columbus, Ohio.—A recent note from Mr. E. McMillin, of the Columbus (Ohio) Gas Light and Coke Company, conveys the information that death has robbed him of the services of head-foreman Michael O'Brien, who had been connected with the works for the past fifteen years, and who was in every respect an efficient and faithful assistant. The position held by O'Brien was an important one; indeed, its duties are more arduous and responsible than those of many a one holding an engineer's berth in the smaller plants. Wm. Enfield, formerly at Burlington, Iowa, succeeds to the place thus made vacant.

Personal—Mr. Wm. S. Burnett, who for the last seventeen years has been in charge of the Flatbush (L. I.) Gas Company's works, recently handed in his resignation to the board of directors. To the writer's own personal knowledge, Mr. Burnett should be attributed with having made this plant one of the best paying ones in the State of New York; and we submit that it is, to say the least, rather ungracious on the part of the company to dispense with Mr. Burnett's services simply because he has gotten old. And, putting it plainly and baldly, no other cause existed to make it expedient that the hint was given which led to the handing in of the resignation. This personal is inserted without Mr. Burnett's knowledge; indeed, we only came across the "true inwardness" of the case by the merest accident.

Patent Office Operations for Last Fiscal Year.—From the report of Commissioner of Patents, Mr. Benjamin Butterworth, for operations terminating with the close of fiscal year ended June 30th last, we note that the numbers of applications for patents during the twelve months reached a total of 35,204; applications for designs 1,322; applications for re-issues 244; for registration of trade marks 1,077; for registration of labels 975—a grand total for all classes of 38,822. Number of caveats filed 2,762; number of patents granted, including re-issues and designs, 22,822; number of labels registered 833; trade marks 903—total 24,558. Number of patents expired 10,230. The receipts from all sources were $1,145,433, an increase of $49,548 over receipts for 1883. Expenditures (excluding printing) were $901,413, leaving a surplus of $244,019. The increase during year over preceding one in number of all sorts of applications was 3,088. The number of applications awaiting action by office on June 30th, 1884, was 9,186, or an increase of 5,087 over the accumulated applications at end of preceding year.

Suffocated by Gas.—On Wednesday evening, Nov. 5th, a visitor who arrived in Rutland, Vt., on one of the early evening trains, went direct to the Bardwell House, signed his name on the hotel register as John Laselle, and retired to the room assigned him. Early on the following morning a

strong odor of gas prompted an investigation as to its source, and it was traced to the apartment occupied by Laselle. He was found dead in bed; the burner on bracket had not been shut off—at least it was found fully turned on when the discovery of his condition was made.

Cheap Natural Gas.—The price charged to users of natural gas in Pittsburgh, Pa., was recently reduced from forty to thirty cents per 1,000 cubic feet, a further discount of ten cents being allowed conditioned upon prompt settlement of accounts. This ought to be considered cheap enough charge for fuel supply.

A Plumber who will Likely Get what He Deserves.—In our last issue mention was made of an explosion of gas that occurred in the house of a Mrs. Hutchins, a resident of Montreal, Canada, made possible through the carelessness of a plumber employed to make a service connection with a gas stove. One of the persons injured, a domestic named Mary Lynn, has since died from the effects of the shaking up received. The coroner's jury that investigated the matter proved to have a thorough understanding of its duty in the premises, and, guided by the testimony taken, which was clear and conclusive as to culpable negligence, returned a verdict of manslaughter against the offending plumber. The name of the culprit is Thomas Brennan. As a contrast to the action of the Montreal jury we here give a sample result of a finding obtained in Brooklyn, N. Y., in a case where three persons lost their lives owing to a plumber's inexcusable neglect.

Asphyxiated.—A man named Louis Schiff hired the ground floor of the premises at No. 708 Broadway, Brooklyn, E. D., early in the month of November, intending to carry on the business of shoe manufacturing therein. The rear part of the store space had been partitioned off into two separate apartments, and the work of fitting up the store proper and show windows was being proceeded with. The shelves and other paraphernalia had been placed in position, and three hanging chandeliers were to be used as a means of illuminating the store show-rooms. The show-windows were to be lit by the aid of side brackets, and on the afternoon of November 14th the plumbing arrangements had been completed to the point of having the window service pipes in place all ready for the screwing on of the fixtures; but in consequence of knocking-off time being reached, the pipes were left uncapped. The meter had been placed in position, and connection with the street main had been made, but no occasion had yet arisen for requiring illumination of the place. At about seven o'clock on the date named a consignment of stock arrived, and Mr. Schiff, in order to facilitate handling of the goods, turned the gas on at the meter and lighted one or two of the chandelier jets. A strong odor of escaping gas manifested itself, but no especial significance was attached to the circumstance, Schiff evidently thinking that, as the stowing away of the stock would take but a few minutes, the shutting off of the supply would end the leak. Unfortunately he failed to turn the meter cock, simply extinguishing the chandelier jets when the goods were secured. It had been Schiff's custom, in company with two of his employees, to retire to rest for the night in beds in one of the small apartments at the rear of the store. The men, being fatigued with their day's work, immediately prepared for bed and went to sleep, the escaping gas meanwhile filling the air of the place with its deadly presence. When the workmen arrived on the following morning, lively rapping on the door brought no response, and the volume of gas had become so great that its presence could easily be detected by those on the outside of the building. A policeman was summoned, who effected a forcible entrance, and those who were admitted with him were almost stifled. The windows and doors were thrown open, and the gas at once shut off at the meter. Schiff and his two unfortunate workmen (a father and son named Fleischauer) were found lying dead on their cots. The testimony taken by the coroner's jury developed the fact the gas was supplied by the People's Company, and also proved the existence of the state of the piping as it was left by the plumber when he quit work on the night so fatal in its developments; yet the "twelve good men and true" brought in a verdict of "accidental death occasioned by the inhalation of illuminating gas," without any mention whatever of the part played by the mechanic (?) whose action rendered possible the train of circumstances which ended the lives of three human beings.

An Explosion of Gas.—People residing in the vicinity of Eleventh and South 3d streets, in the district supplied by the Williamsburgh Gas Light Company of Brooklyn, N. Y., have recently had occasion to complain that the gas mains traversing that locality were in a leaky condition. It was claimed that the escaping gas penetrated the sewers and obtained an entrance into the dwellings bypassing into the house-sewer connections. Complaint was made to the officials of the gas company, and the inspector sent by them to examine into the matter reported that it was sewer gas pure and simple which occasioned the trouble. Notwithstanding the "expert's" report, and there being no let up to the offensive odors, renewed complaints were made, and this time the company sent a "gang" of laborers to the place mentioned, who proceeded to strip the main. This was done at two different points, but no serious defect was discovered. The foreman of the gang had his attention directed to a sewer manhole in the vicinity, and, sure enough, the impression thereby created on his nostrils was sufficient to convince him that there was a leak somewhere. He stooped down, did this intelligent foreman, and ignited a match in order to make visible demonstration of the accuracy of his olfaction. It was accurate; everybody in the neighborhood was speedily convinced of that, for the ensuing explosion shook the ground most thoroughly, and threw the "intelligent foreman" flat on his back. The bystanders, always to be found supervising labors of this nature, were also treated in rather harsh fashion. A domestic might possibly have some sort of excuse for calling in a naked light when hunting for a gas leak; but what excuse can be given for the Williamsburgh Company's foreman?

An Oil Fire.—An explosion of a small can of gasoline in the filling shed of Chas. Pratt & Co.'s oil works, located on Bushwick Creek and foot of North 12th street, Brooklyn, N. Y., on date of November 14th, caused a fire that resulted in a damage of $5,000. The filling shed at the time contained 200 barrels, besides several cases, of gasoline, and these all exploded at various times during the conflagration. A high brick wall separated the burned out department from the huge stills and other refining apparatus of the mammoth works, this building provision undoubtedly preventing the total destruction of the place. Such loss would mean the vanishing of hundreds of thousands of dollars. The works of the Williamsburgh Gas Company are located directly opposite Pratt's refinery.

Fatal Accident at an Electric Generating Station.—Three visitors stepped into an electric lighting generating station at Syracuse, N. Y., one evening of the past month. One of them was noticed by his companions to stoop over and reach out his hands towards a thirty-light dynamo machine. Instantly he was drawn close to the generator, without noise and without uttering a sound. The unfortunate man had unwittingly seized hold of the positive and negative rods, while but a moment or two before he had been boasting of his familiarity with the principles of electrical science. When an attempt was made to remove the corpse, pieces of flesh from his hands adhered to the rods. The contraction of the muscles of his body was so great that both legs and arms were drawn out of shape, and the head drawn forward so that the chin pressed tightly against the chest.

Grand Haven (Mich.) Lighted with Gas.—Grand Haven, a post town and capital of Ottawa County, Mich., located on Grand River at its junction with Lake Michigan, successfully inaugurated a new era in its history on the night of Nov. 21. On that date the Grand Haven Gas Light Company first commenced supplying gas for purposes of street and domestic illumination. We understand that Messrs. Miller & Son are the gentlemen engaged in directing the enterprise.

Killed by Gas.—A young girl named Mary O'Rourke paid a visit to some friends residing at No. 288 Eighth avenue, New York city, on the evening of Sunday, Nov. 23. On account of the severity of the storm that developed itself on the night in question the young woman was persuaded to remain overnight at the house of the family she was visiting. The pin on the burner key to the gas fixture in the room in which she slept was broken off, the result being that when she extinguished the jet preparatory to retiring to bed the gas current was inadvertently turned on again. When a messenger was sent to awaken her on the following morning the apartment was found to be filled with gas, and the occupant discovered dead in her bed.

Mr. W. L. Scott, of Erie (Pa.) Returned to Congress.—The genial owner of the famous Ocean Mine, in the Youghiogheny River gas coal district, has given ample evidence of his popularity among his fellow-citizens, who, at the recent general election triumphantly returned him to represent them in the next Federal Congress. Now, had Mr. Scott been a republican this result would have contained nothing of the wonderful about it; but when it is considered that the district has a normal republican majority varying between 3,500 and 4,000 votes, and that Mr. Scott is an uncompromising democrat, his reversal of the political complexion of the district may be set down as convincing testimony to his popularity and standing. Erie City, Mr. Scott's home, generally even in its division as to political questions, gave him a majority of close on to 2,800. Mr. Scott's "run" puts one in mind of the fleetness shown on many an occasion during the past summer by his celebrated thoroughbred known to the racing world as "Florio."

Trouble with the Hell Gate Arc Light.—An engineer who recently inspected the tower lights in the Hell Gate channel says that the carbon points will remain unlighted every stormy night this winter unless the present elevator system of machinery in use is changed.

Properly Constituted Mortar.

The *Building Times* very properly observes that machinists and engineers often have occasion to use mortar, and will value the appended information: Good mortar is a solid silicate of lime—that is, the lime unites with the silica or sand to form a silicate of lime. In ancient days those who had some conception of the way the two things united superintended their mixing; but nowadays anybody is supposed to know how to make mortar, while nobody knows much about it. Dry lime and dry sand laid together or mixed and kept dry for a thousand years would not unite to form silicate of lime any more than acetic acid and carbonate of soda dry in a bottle would effervesce. To make silicate of lime just as good as was made by the Romans, all that is necessary is to proceed intelligently: Procure good caustic—that is, fresh-burned lime, and if you find it all powder—that is, air-slaked, don't use it; use only clear lumps. Slake this (if possible in a covered vessel), using only enough water to cause the lime to form a powder. To this while hot add clean sand—not dirt and loam called sand, but sand—and with the sand add enough water to form a paste. Then let it lie where it will not become dry by evaporation—if in a cellar so much the better; for as soon as you have mixed the sand and lime as above, they begin to react one on the other, and if not stopped by being deprived of moisture, will go on reacting until silicate of lime (as hard as any silicate of lime ever was) is formed.

But if you take this so-called mortar as soon as made, and lay bricks with it, unless the bricks are thoroughly wet you stop the formation of silicate of lime, and might as well lay your bricks in mud. Lime and sand, after being mixed, might lie two years with advantage, and for certain uses, such as boiler setting, or where the whole structure of brick and mortar is to be dried, the mortar ought to be mixed for one year before use, and two would be better; but for house building, if the bricks are so wetted as not to rob the mortar of its moisture as soon as used, mortar that has been mixed a month will form good solid silicate of lime among the bricks it is laid with in ten years, and will be still harder in a hundred years. The practice of mixing mortar in the streets and using it at once is as foolish as it is ignorant, and would be no improvement. Silicate of lime is made only by the slow action of caustic lime and sand, one on the other—under the influence of moisture. Dry they never will unite, and mixing mortar as now mixed and using it at once, so as to dry it out and stop the formation that the mixing induced, is wrong.

Electric Light in Lighthouses.

The corps of engineers who are carrying on the Government experiments at Staten Island with the intention of demonstrating the efficiency and value of the electric illumination of lighthouses, do not appear very enthusiastic in their statements concerning the superiority of electricity over oil as a means of coast lighting. Mr. Joseph Funck, who for the past thirty years has been connected with the Lighthouse Department—he now has charge of the Staten Island works—in varying capacities, gives it as his opinion that the adoption of the electric light in our American lighthouses is quite unlikely. In speaking on this subject recently he remarked: "To begin with, one electric light costs as much as eight oil lights of the same grade. I visited the South Foreland light in England in 1878. It is the only electric light on the British coast, and is kept up at enormous expense. There is a complete duplicate of the entire electric plant in case of accident, and in addition to this oil lamps are kept constantly ready in the event of a total electric collapse. Five men and a chief are required to attend the lights, and 1,800 pounds of coke are consumed every twenty-four hours. Two men and a chief, and a few gallons of kerosene oil at fourteen cents per gallon, would run the same lighthouses with oil lamps, and the result would be practically about as good.

"We have fifty-one lights of the first order, and in all but nineteen of these we burn kerosene. In these nineteen we shall soon abandon lard oil for kerosene, which is as good, and many times cheaper. Were we to adopt an electric system, the lenses in all these lighthouses would have to be changed. We pay $11,000 for the Fresnel lenses of a first-order light. I think the electric light might penetrate a trifle further through a fog than one from oil, but a really dense fog smothers all lights, and the only safety lies in fog whistles and bells. The advantages of the electric lights are, in a word, so small, so far as I can see, that it would not warrant the enormous additional expense of adopting them."

Correspondence

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

How the "Pirates" Seem to Regard Each Other.

PORTLAND, MAINE, Nov. 25, 1884.

To the Editor AMERICAN GAS LIGHT JOURNAL:

Some time since quite a number of chemists and engineers investigated the quality and manufacture of water gas. I think it was clearly shown as a result of that investigation by a majority of these chemists that the excess of carbonic oxide contained in water gas rendered its use, particularly in dwelling houses, much more dangerous than that of illuminating gas made from coal. Again, the engineers who examined the mode of manufacture did not find that the statements made regarding the cost of manufacture of water gas tallied with the figures obtained when the apparatus was turned over to them for operation.

It is quite true in some instances, where the new-fangled apparatus had been introduced into gas works, which through gross mismanagement, or by reason of the old plant having become entirely unfitted for further use, or in works where not even the slightest improvement had been for years instituted in the methods of coal carbonization, or in situations where the output was very limited, that the water gas apparatus has cheapened the cost of production; but the writer has not as yet heard of a single instance where the water gas system has been applied in works carbonizing an average of 25 tons of coal daily, in which any material, or, in fact, *any* saving has been accomplished.

Now, in addition to the rest of the drawbacks attending this dangerous system of apparatus and method of gas manufacture, there come to us, from various parties pretending to own patent rights, etc., circulars threatening all sorts of dire things against all persons found using certain valuable (?) devices belonging to the signers thereof. The first, real and "Original Jacobs," as set forth, "invented the only practical method of producing water gas." Modest claim this; and then in the same breath he goes on to speak of other parties (equally modest, of course, in the scope of their claims for fame and business) as, "all of these pirates who hope for success;" and then, as if audibly confessing his own transactions in such matters, he proceeds to speak of these pirates (please bear in mind, Mr. Editor, that this word "pirate" is not mine) in the following delicate strain: "That by adding some little thing, or altering the form somewhat, they *can deceive gas companies long enough to effect a sale.*"

The use of such kind and fraternal words toward one another seem to those of us who have come in contact with some of these water gas people to be just such as all men engaged in earning an honest living would properly apply to parties who, by false statements and promises (uttered with no shadow of intention of ever carrying them out), are constantly pleading for recognition as great friends of the public; while, on the contrary, as they say of each other, they are indeed but "pirates who hope for success by adding some little thing" that will "deceive gas companies long enough to effect a sale."

The next extract coming to our notice in another of the assertions made by these honest (?) gentlemen, in describing their co-conspirators, chimes so well with the hearty wishes of all fair-minded persons, men who believe in honest dealing, and also in the punishment of "all these pirates who hope for success," reads as follows: "We are pleased to see that a heavy hand has fallen upon the boldest * * * * * and trust there will be no stop or halt until the last one has received his just deserts." It is further added by the writer that the sentiments so elegantly and forcefully expressed by these parties, in fraternal recognition of each other, meets with his most unqualified approval, and to which he can cheerfully say "Amen!"

While writing the above another circular, from still another set of parties engaged in this business of puffing water gas manufacture, has been received; and, unless prevented by other calls upon my time, I will venture to make some comment upon it at another period. Very truly,

PASSAMAQUODDY.

Mr. Somerville Dissents from the Position Taken by Col. Stedman in Regard to the "Valon Theory."

ENGINEER'S OFFICE INDIANAPOLIS GAS LIGHT AND COKE CO.,
INDIANAPOLIS, IND., Nov. 20, 1884.

To the Editor AMERICAN GAS LIGHT JOURNAL:

I was in hope that the special committee appointed to examine and report upon the speech of the President (Col. W. A. Stedman) at the late meeting at Washington would have expunged or modified his sarcastic allusion to that "English philosopher," as he called him—Mr. W. A. Valon, of Ramsgate, England. I find, from a printed report of the speech just received, that they have not done so. I wish to state that the sentiments of Colonel Stedman are not those of the entire Association. I for one believe that Mr. Valon is right in both theory and practice. The experiment which Col. Stedman quotes as satisfactory to him is by no means so to me.

The 975° were obtained by sucking air through a small porcelain tube by the aid of an aspirator—a condition of things which does not, and cannot, exist in the air flue of a regenerative furnace. In my air flue the draught is so small that it will not give more than one-tenth of an inch pressure by the gauge. In fact, the air flue is nothing more than a tube open at both ends to the pressure of the atmosphere; and it is a manifest absurdity to suppose that the air is heated in this flue to 975° or 1,000°.

Indeed, the question may be easily tested by anyone. Close the air flue up entirely for, say, fifteen minutes; if the air is passing through these flues at a temperature of 1,000°—as Col. Stedman thinks it does—then an instantaneous increase of temperature will occur on the brickwork of the flue; but in fact there is no apparent increase of temperature when the flues are shut, nor decrease when they are opened.

My opinion, confirmed by two years' experience, is that the saving of fuel from the use of the regenerative furnace is gained (1st) in the increased depth of furnace; (2d) in supplying the furnace with hot coke; and (3d) dry air from the air flues—and that an elaborate system of air flues is not required, but is money thrown away. Very truly,

JAMES SOMERVILLE.

THE AMERICAN
GAS LIGHT JOURNAL

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TUESDAY, DECEMBER 2, 1884.

The Market for Gas Securities.

The market for city gas shares is in a very unsettled condition, and the tendency appears to be in the direction of lower prices. The rumor mongers are once more busily engaged in foretelling what is to take place concerning the probable future position of the Equitable Company towards the new Consolidated corporation. The attitude of the Mutual folks also occupies a large portion of the attention of the "prophets," but the plain truth in both cases is that only those actually behind the scenes can say what is or is not to be. The "guessers" are also amusing themselves in an effort to put a price on the Consolidated stock. One particularly bold financier has offered the stock at 85; but it need not be added that the offer was withdrawn almost as soon as made. A prominent holder of city gas stocks has promulgated the opinion that the new shares will bring a figure close on to par, and gives excellent reasons for such belief. "Outsiders" had better wait; and we certainly would advise them not to be too free in offering "futures." Metropolitan shares furnish an exception to the generally weak tone of the market, a marked advance being chronicled during the interim of our last report. Harlem stock is fairly steady—the "Elkins" scare seeming to have outlasted its usefulness as a "bear" argument. A despatch from Albany, N. Y., to one of our evening dailies, of date of Nov. 26th, conveys the news that there has been filed in the County Clerk's office (Albany) a certificate incorporating the Consolidated Lowe Gas Company, with a capital of $5,000,000. It is understood that the incorporators "wanted the thing kept quiet." The objects of incorporators are the construction and operation of gas works in various parts of the country. The "quiet" gentlemen are Messrs. T. S. C. Lowe, G. H. Scribner, and A. B. Cornell. Muller sold at auction, on Nov. 19th, 220 shares Manhattan, at 269; 105 shares Harlem, at 114; 200 shares New York, at 158½; $3,000 Nassau scrip (Brooklyn), at 87¼; $20,000 Williamsburgh (Brooklyn) 6 per cent. bonds, at 104¾ to 105; 20 shares Metropolitan, at 238½; and 20 shares Mutual, at 120½. On November 26th $15,000 Williamsburgh 6 per cent. bonds, at 105¼; 45 shares Mobile (Alabama) gas, at 52; 10 shares Metropolitan, at 233.

Consolidated, of Baltimore, is still on the "boom;" Jersey City gas is firm; San Francisco shares show somewhat higher quotations.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks (with A. E. SCOTT & CO.,)

72 BROADWAY, NEW YORK CITY.

DEC. 2.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share. ☜

	Capital.	Par.	Bid	Asked
Central	$440,000	50	—	70
" Scrip	220,000	—	47	57
Equitable	2,000,000	100	90	93
Harlem	2,000,000	50	115	120
" Bonds	170,000		—	—
Manhattan	4,000,000	50	265	270
Metropolitan	2,500,000	100	230	235
" Bonds	658,000	—	110	112
Mutual	3,500,000	100	120	123
" Bonds	1,500,000	1000	104	106
Municipal	3,000,000	100	205	210
" Bonds	750,000		107	110
New York	4,000,000	100	150	155
Northern	125,000	50	—	80
" Scrip	108,000			
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	125	128
Citizens	1,200,000	20	87	89
" S. F. Bonds	320,000	1000	106	110
Fulton Municipal	3,000,000	100	152	154
" Bonds	300,000		104	108
Peoples	1,000,000	10	80	84
" Bonds	290,000	—	105	110
" "	250,000	—	90	95
Metropolitan	1,000,000	100	94	98
Nassau	1,000,000	25	114	118
" Ctfs	700,000	1000	85	90
Williamsburgh	1,000,000	50	138	142
" Bonds	1,000,000	—	104	108
Richmond Co., S. I.	300,000	50	64	75
" Bonds	40,000	—	—	—
Out of Town Gas Companies.				
Buffalo Mutual, N. Y.	750,000	100	80	85
" Bonds	200,000	1000	95	100
Citizens, Newark	918,000	50	103	115
" " Bonds	124,000	—	105	110
Chicago Gas Co., Ills			150	155
Cincinnati G. & C. Co.			178	182
Consolidated, Balt.			94½	95
" Bonds			112¾	113
Central, S. F., Cal.			—	62
Capital, Sacramento, Cal.			55½	—
Hartford, Conn	750,000	25	124	130
Jersey City	750,000	20	125	130
Laclede, St. Louis, Mo.	1,600,000	100	100	—
Louisville, Ky	1,500,000	50	100	103
Montreal, Canada	2,000,000	100	165	175
New Haven, Conn		25	166	170
Oakland, Cal.			29½	30
Peoples, Jersey City		—	—	75
" " Bonds			—	—
Paterson, N. J		25	96	99
Rochester, N. Y.		50	75	80
Washington, D. C.	2,000,000	20	185	190
Wilmington, Del.		50	188	—
Yonkers		50	—	—
St. Louis, Missouri	600,000	50	—	575
San Francisco Gas Co.				
San Francisco, Cal.			C3¾	64

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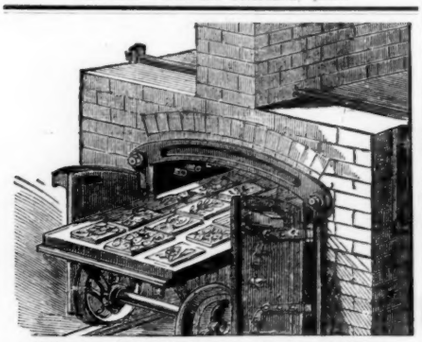

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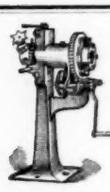

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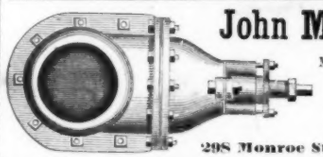

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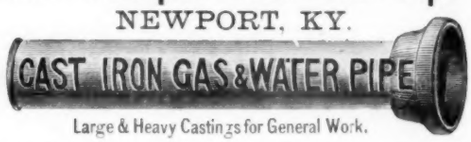

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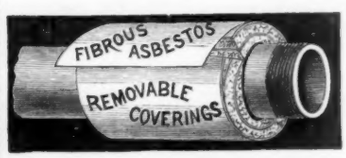

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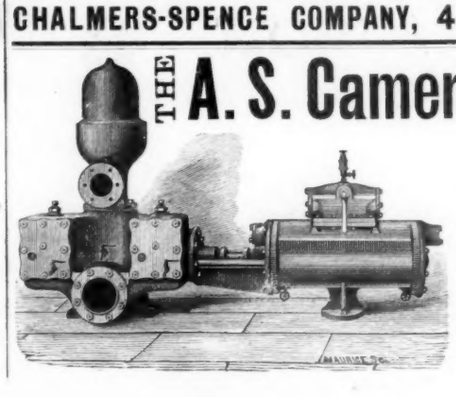

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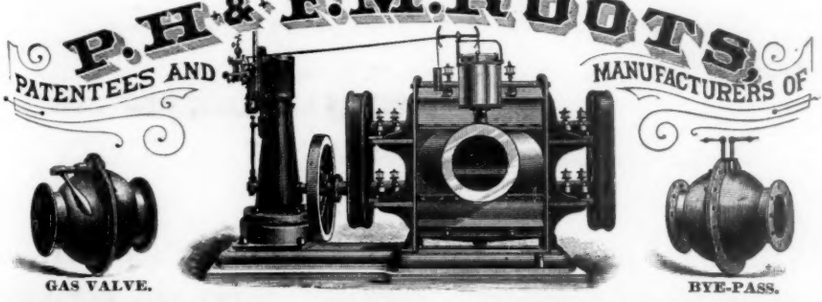

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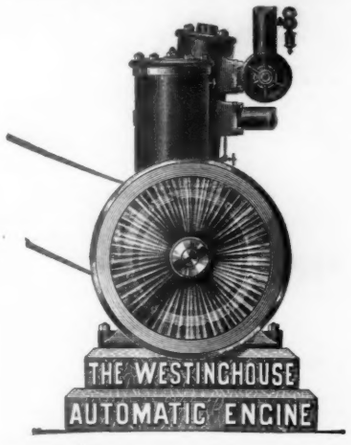

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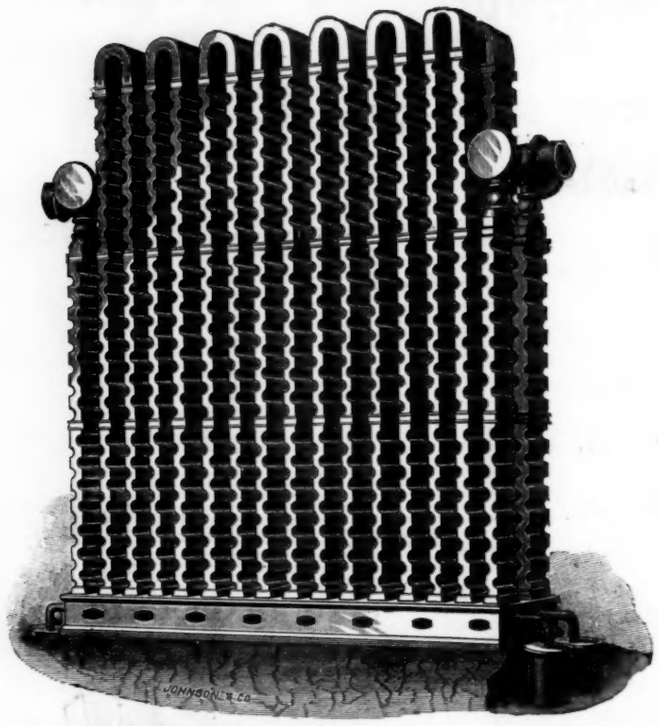

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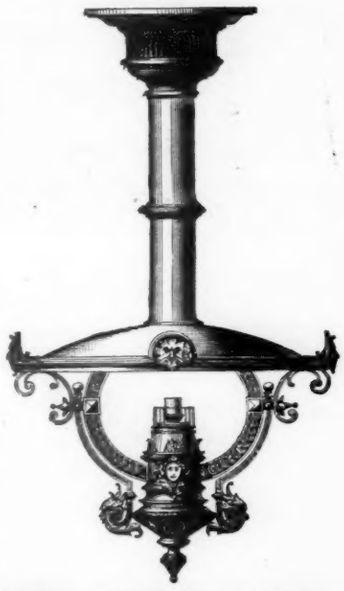

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Belgium	8	5,420,000
Germany	16	8,200,000
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Dumfries Corporation	250,000
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King's Lynn Gas Co	300,000
Leiden, Holland	600,000
Lincoln Gas Co	400,000
Liverpool Gas Co	2,000,000
" "	3,000,000
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SAN FRANCISCO GAS CO	2,000,000
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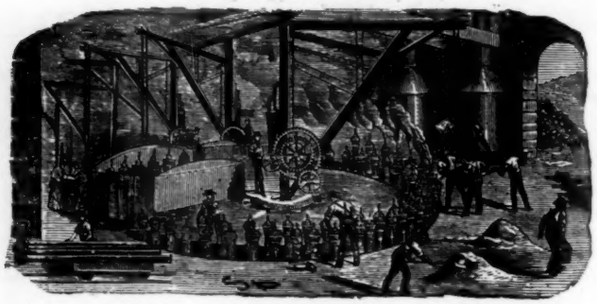

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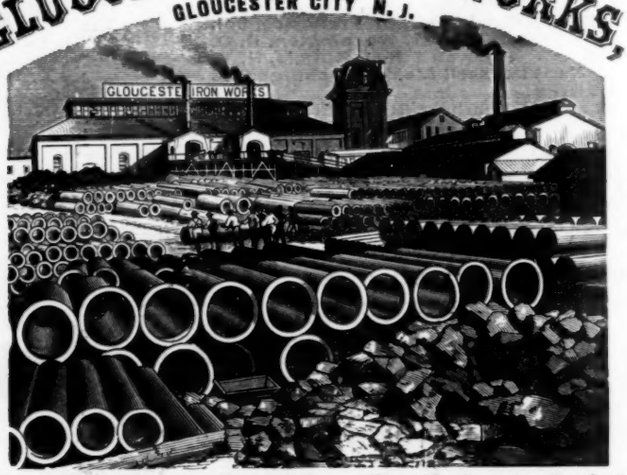

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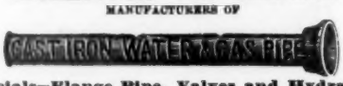

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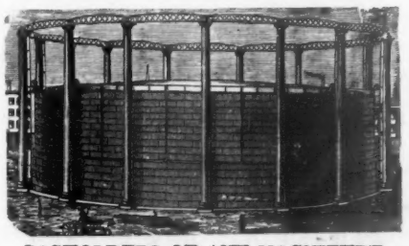

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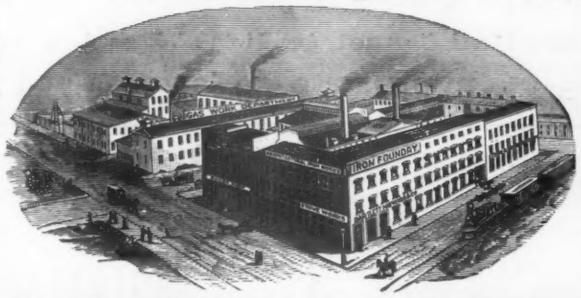

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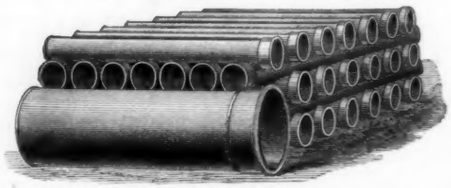

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